

AUTOMOTIVE INDUSTRIES

A C H I L T O N P U B L I C A T I O N

GENEVA SALON

Albrecht Graf Goertz, designer of the BMW 507 and other popular European cars, reports that major car-makers abroad are adopting basic U.S. car model design concepts

By Albrecht Graf Goertz 1960

MAY 1, 1960

ALSO IN THIS ISSUE

SAFE DRIVING AT
170 MILES PER HOUR

RUSTPROOFING THE
CORVAIR UNDERBODY

USERS WANT MORE
INDUSTRIAL ENGINES

NEW PROCESS FOR
MAKING PATTERNS

**MANAGEMENT
ENGINEERING
DESIGN
PRODUCTION**



Allis-Chalmers uses
RYKON Grease
in bearing shield
—offers farmers
better disc harrow

**Can RYKON Grease
help you improve
your product?**

Situation: Bearings of a disc harrow in service are always turning in dusty conditions, oftentimes completely covered with soil. Such bearings in the Allis-Chalmers harrow are protected with grease-coated rubber shields. The grease guards against dirt getting past the shield and into the bearing.

What was done: Allis-Chalmers project engineer in the LaCrosse, Wisconsin plant, Maynard Walberg, called Fred Parkinson, Standard Oil lubrication specialist, for a sample of RYKON Grease. In conditions simulating field service, RYKON Grease was tested. Bearings were rotated in the most abrasive dirt available—Mississippi sand with a high quartz fraction.

What happened: Tests were started and run to destruction. Prior to the use of RYKON Grease, bearing failures occurred at 500 hours. On switching to RYKON Grease, these tests were pushed to 2,000 hours. At this point, tests were stopped. Bearings were still in operating condition.

What you can do: Find out how RYKON Grease might help you offer your customers a better product. Inquire of the Standard Oil lubrication specialist nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana)**, 910 South Michigan Avenue, Chicago 80, Illinois.

You expect more from

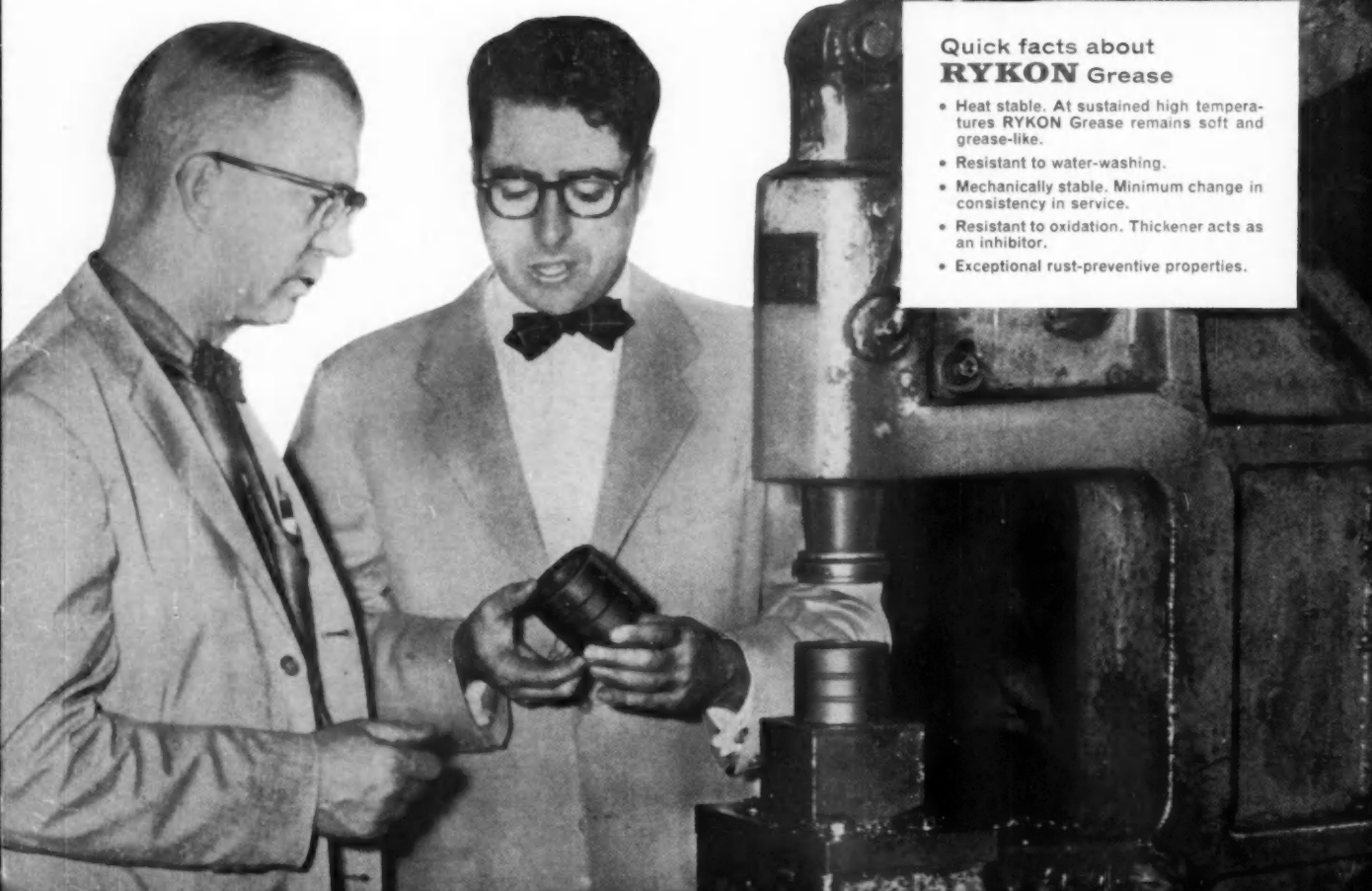


and you get it!

Maynard Walberg, Allis-Chalmers project engineer, and Standard Oil lubrication specialist Fred Parkinson, examine disc harrow bearing assembly. Fred is well equipped through training and experience to help industrial customers with lubrication problems. He has been doing this work for 11 years at Standard. He has a degree in chemistry and engineering from Brown University. Plus that, he has completed the Standard Oil Sales Engineering School.

**Quick facts about
RYKON Grease**

- Heat stable. At sustained high temperatures RYKON Grease remains soft and grease-like.
- Resistant to water-washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as an inhibitor.
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HOLES
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HAVE
IN**

MIND?

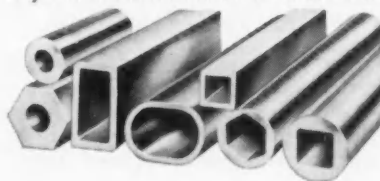
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If salt air won't harm the eye-appeal of quality Nickel-Chrome Plating... what will?

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

MAY 1, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors
• Engines • Bodies • Trailers • Road Machinery •
Farm Machinery • Parts and Components • Accessories
• Production and Processing Equipment •
Design • Production • Engineering • Management

VOL. 122 No. 9

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MEMBER



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This is BENDIX PRODUCTS DIVISION...



BENDIX MOBILE LABORATORY prepares to take to the highway in the interests of better braking and greater highway safety. Aboard is every scientific instrument needed to measure brake design and performance from every possible angle.

To add even more depth to its research and testing of brakes and power brakes, Bendix Products Division now operates a unique mobile laboratory to gather the most complete braking data ever assembled.

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No one else in the world does as much brake research and development work as Bendix—"Brake Headquarters of the World." Why not put this experience to work for you!

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TEST RESULTS for each run can be checked visually by Bendix engineers during stops and are also recorded permanently on 25-channel oscillograph for detailed study later. Two-way radio (right) permits conversation with tractor driver and with South Bend headquarters.



CAB OF TRACTOR in tractor-trailer combination carries supplementary instrumentation to that in trailer, so that driver can maintain complete control in line with test stop instructions given by engineers in trailer.

↑ **PART OF LARGE FLEET** of Bendix brake test vehicles operated by Bendix Automotive Engineering, Research, Development and Road Test Departments. Much of work is done in mountainous country. Bendix also maintains large test facility at Jennerstown, Pa.

MOBILE LABORATORY NO. 2 is also used to test brakes and power brakes in all kinds of weather over all kinds of terrain. Trailer interior houses battery of instruments for checking and recording results of test runs. ↓



Bendix PRODUCTS DIVISION
South Bend, IND.



HOW THE ENGINEERING SERVICES OF

Central Foundry

*help you design better
castings at lower cost*

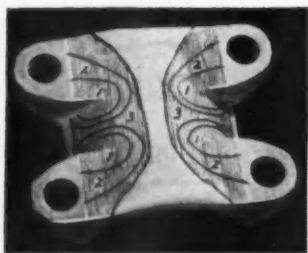
Many new developments here at Central Foundry have broadened the field of application for castings and have given design engineers greater latitude. To assist you in exploiting these new methods and materials to fullest advantage, each of our engineering departments—design, experimental, process and metallurgy—is at your disposal. Central Foundry is also using a number of testing techniques such as stress analysis, cobalt radiography and sonic testing, that

have proven invaluable in lowering the cost and improving the quality of castings. These procedures help us to determine the best design and method of producing a casting, either by the green sand method or the shell mold process, and the best material for the casting, either grey iron, malleable iron or ArmaSteel.

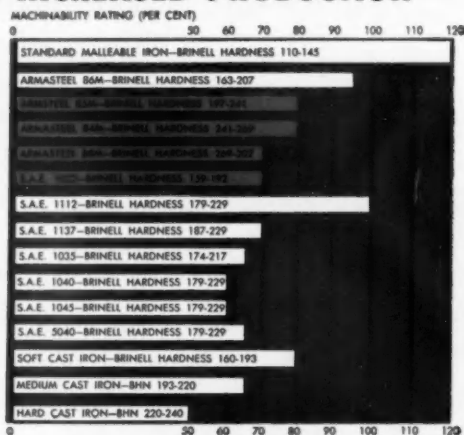
Central Foundry has the capacity to deliver, on schedule, quality castings in production quantities.

STRESS ANALYSIS FOR IMPROVED DESIGN

An important part of our engineering services is the stress analysis laboratory. Stress analysis discovers the amount of stress on a part due to its service function and is an important aid in determining and improving the strength of a part. Improved casting design can be accomplished through the use of stress-analysis by more effectively distributing the metal in the part. The U-bolt anchor plate shown here is a case in point. Our customer was experiencing failures in this part and asked us to see what we could do to solve the problem. Using stress analysis the part was completely redesigned for maximum efficiency. The redesigned part is 35% stronger, 42% lighter and less costly.



EXCELLENT MACHINABILITY FOR INCREASED PRODUCTION



CENTRAL FOUNDRY DIVISION



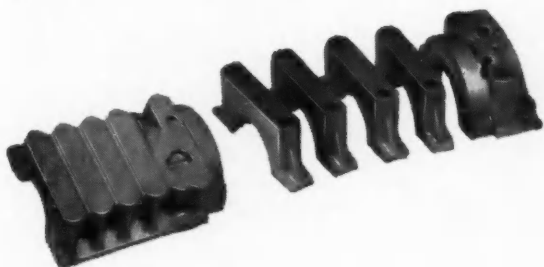
REDESIGN FOR STRENGTH

This is a rear spring clip pad that was converted to a casting with the help of stress analysis. The clip pad supports the shock absorber arm and clamps the spring to the rear axle of an automobile. When produced as a stamping, this part weighed 4-1/4 pounds. However, when designed as an ArmaSteel casting, weight was reduced to 2-9/10 pounds. Most important, based on comparative stress analysis tests, the casting is 30% stronger than the stamping. (In addition, the holes are produced by the foundry, making it unnecessary for the customer to punch them.) This conversion from a stamping to a casting resulted not only in increased strength, but in substantial cost savings, as well.



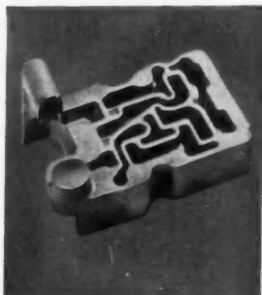
PROCESS ENGINEERING FOR LOWER COST

Our process engineers are continually looking for ways to more economically produce castings, thus lowering the finished-product cost. Shown here is a single casting that combines 5 bearing caps used on a V-8 engine. The casting is almost completely machined as a single piece, and the parts are then separated in a final operation. Substantial savings are realized in both casting and machining costs.



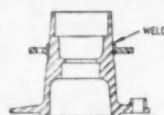
SHELL MOLDING FOR GREATER ACCURACY

Shell molding, a relatively new process of making castings, is now being employed extensively for fast, simple production of complicated castings, such as those requiring narrow, accurate passages and cross sections. It is practically impossible to produce certain parts in any other way without prohibitive costs; this is especially true of ferrous metals. Complicated parts like the manual control valve body shown here, a part of the automatic transmission of a military vehicle, are readily cast in grey iron when the shell process is utilized. The part had been considered as an aluminum die casting, but was thought unsatisfactory because of adverse expansion and wear characteristics. In this case, meeting the requirements for very close tolerances on the thickness and location of ports was made possible by the shell molding process.

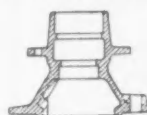


REDESIGN FOR IMPROVED PRODUCT AND ECONOMY

Many of our customers have found that redesigning a product to be made as an ArmaSteel casting rather than as a fabrication, forging or stamping, has resulted in a better part at less cost. The fabricated design of a rear wheel truck hub at the left consists of a forged base with a steel plate welded in place to form the smaller flange. The casting on the right, designed jointly by the customer and our engineers, is of single piece construction, is lighter, stronger and less costly than the fabricated design and eliminates the fitting and welding of the small flange.



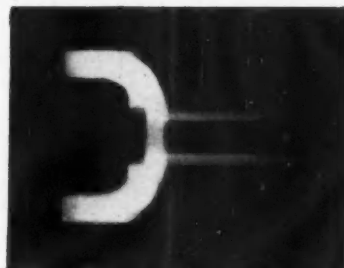
FABRICATED DESIGN



ARMASTEEL CASTING

COBALT RADIOGRAPHY FOR ASSURED QUALITY

Radiography, by means of Cobalt 60, has drastically reduced the time required to check castings and is an important aid in obtaining the best possible casting quality. In an effort to eliminate a machining operation on the universal joint yoke shown here, a design change was made in the tube section of the part. When sample castings of the new design were checked radiographically, it was immediately apparent that the design was unsatisfactory since it caused acute metal feeding problems. By redesigning and further checking by radiography, Central Foundry was able to produce, in the shortest possible time, a lighter casting which required less machining in our customer's plant.



REDESIGN FOR WEIGHT REDUCTION

Vehicle weight reduction is a matter of increasing importance to design engineers . . . and more and more existing parts are being converted from a low or medium to a high strength ferrous material such as ArmaSteel. On the left is a grey iron differential carrier currently used in an automobile. By taking advantage of the superior physical properties of ArmaSteel, it was possible to design the part on the right which is five pounds lighter. The modulus of elasticity of ArmaSteel is approximately 60% greater (the tensile strength about twice as great) than the grey iron material.



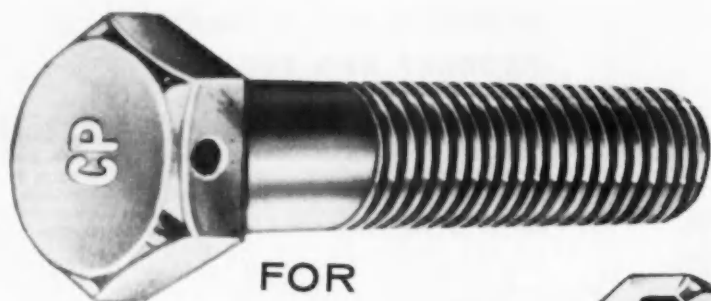
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SAGINAW, MICHIGAN

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AUTOMOTIVE INDUSTRIES, May 1, 1960

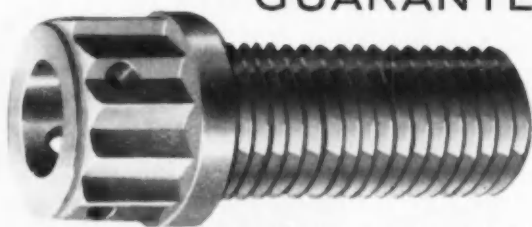
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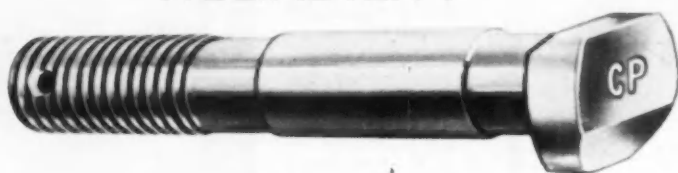
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CALENDAR

OF COMING SHOWS AND MEETINGS

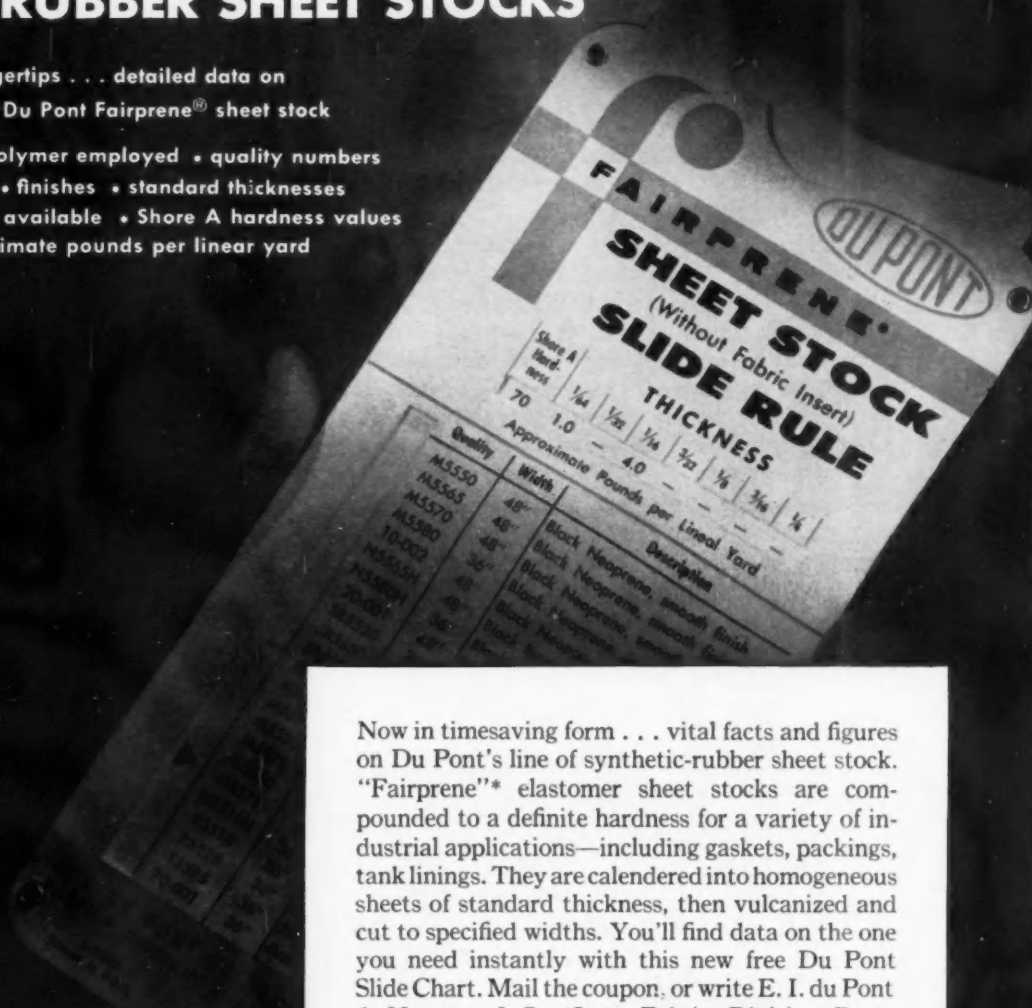
- ISA, 2nd Instrument-Automation Conference and Exhibit, San Francisco . . . May 9-12
- American Foundrymen's Society, Casting Congress and Exposition, Phila. . . May 9-13
- 8th International Automobile Technical Congress, The Hague . . May 9-13
- AIEE, Conference and Convention, Dallas . . . May 12-14
- ASME Production Engineering Conference, Milwaukee . . . May 17-19
- ASME 32nd Annual Oil and Gas Power Conference, Kansas City May 22-26
- Design Engineering Show, New York . . . May 23-26
- ASME Summer Meeting and Aviation Conference, Dallas . . June 5-9
- SAE Summer Meeting, Chicago . June 5-10
- AGMA (Gear Mfrs.) Annual Meeting, Hot Springs, Va. . . . June 6-8
- Material Handling Institute, New England Show, Boston . . . June 6-8
- 1960 Western Packaging & Materials Handling Exposition, Los Angeles . . . July 19-21
- 11th Annual Industrial Research Conference, Harriman, N. Y. . . Aug. 7-13
- American Astronautical Society, Western National Meeting, Seattle . . . Aug. 8-11
- International Heat Transfer Conference, sponsored by ASME, American Society of Chemical Engineers, and IME, ICE (British) . . . Aug. 28 to Sept. 1
- Machine Tool Exposition — 1960 (sponsored by National Machine Tool Builders' Assn.), Chicago Sept. 6-16
- Production Engineering Show, Chicago . . . Sept. 6-16
- 2nd Coliseum Machinery Show, Chicago . . . Sept. 7-15
- ASME Engineering Management Conference, Cambridge, Mass. Sept. 7-9
- Fall Meeting, Material Handling Institute, Virginia Beach, Va. Sept. 12-13
- AWS, National Fall Meeting, Pittsburgh . . . Sept. 26-30

**AUTOMOTIVE
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...THROUGH CHEMISTRY

AUTOMOTIVE INDUSTRIES, May 1, 1960

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division, Dept. AI-05, Wilmington 98, Delaware

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"Fairprene" Slide Chart

☐ Booklet on "Fairprene" elastomer-
coated fabrics and sheet stocks.

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Company _____

Street _____

City _____ Zone _____ State _____

Precision and Versatility for Short Runs

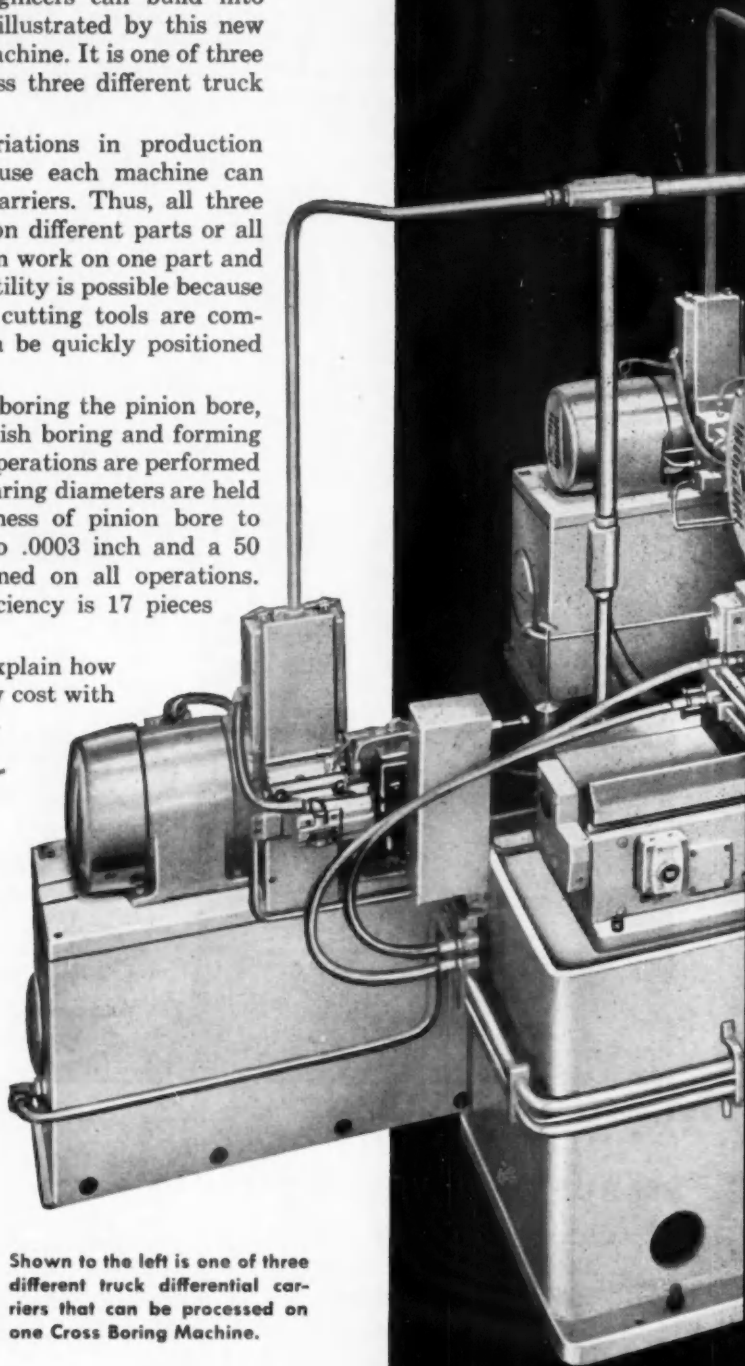
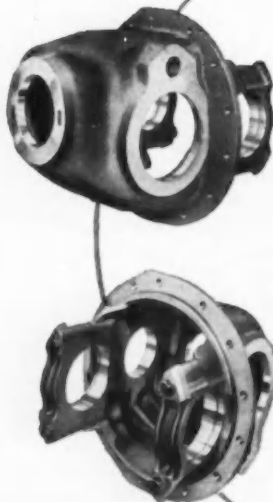
New Cross 'Precision Boring Machine for Differential Carriers

The versatility that Cross engineers can build into automation equipment is well illustrated by this new Three-Way Precision Boring Machine. It is one of three similar units designed to process three different truck differential carriers.

Unusual flexibility for variations in production requirements is provided because each machine can process any one of the three carriers. Thus, all three pieces of equipment can work on different parts or all can work on one part or two can work on one part and the third on another. This versatility is possible because the fixtures, boring heads and cutting tools are completely interchangeable and can be quickly positioned for each carrier.

Processing consists of finish boring the pinion bore, finish facing the pinion boss, finish boring and forming grooves in the cross bores. The operations are performed to a high degree of precision. Bearing diameters are held to less than .001 inch, squareness of pinion bore to pinion mounting face is held to .0003 inch and a 50 micro inch rms finish is obtained on all operations. Rated production at 100% efficiency is 17 pieces per hour.

Let a Cross Sales Engineer explain how you can do precision work at low cost with versatile automation equipment.

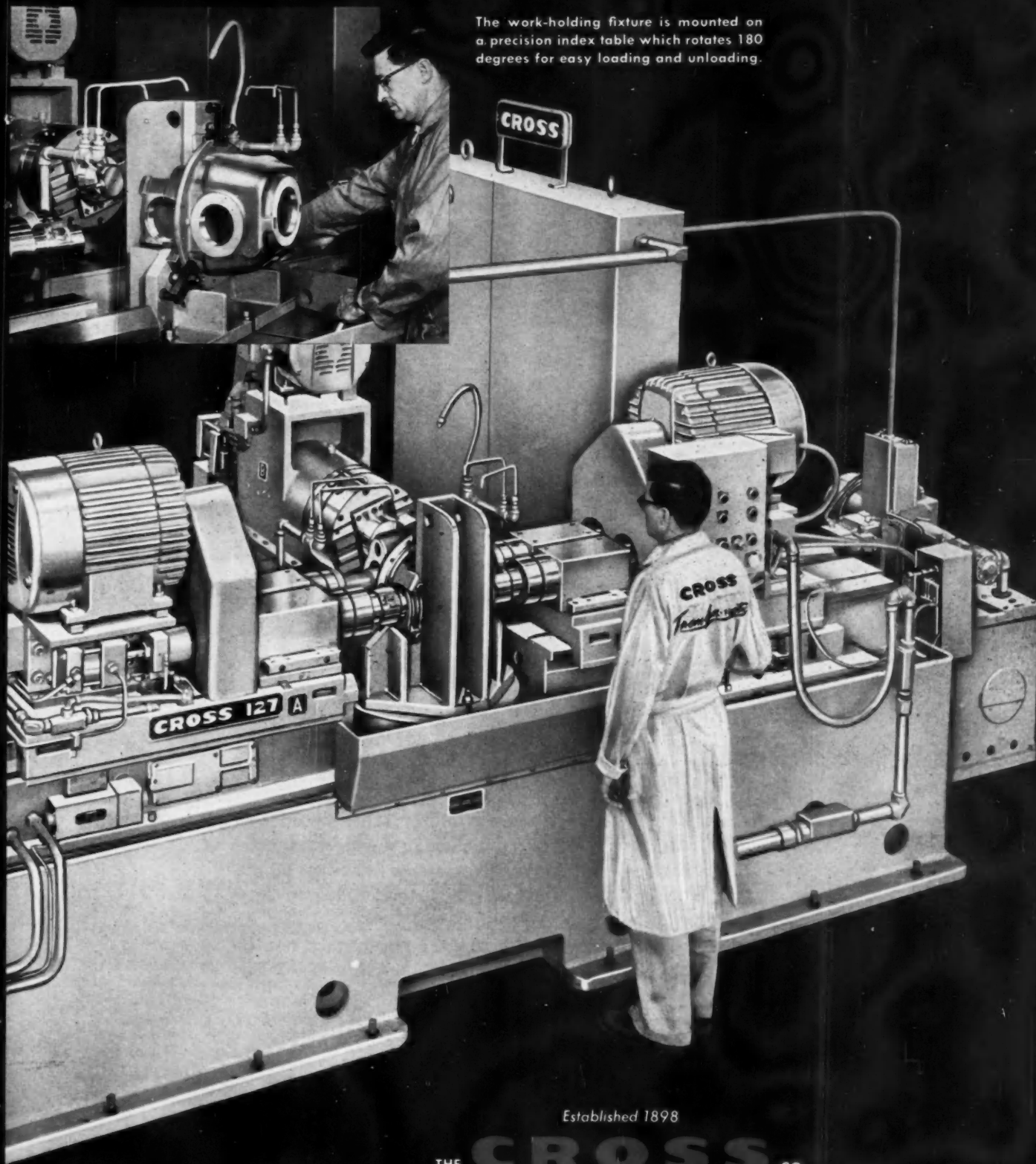


Shown to the left is one of three different truck differential carriers that can be processed on one Cross Boring Machine.

Circle 109 on Inquiry Card for more data

Another Automation First by Cross

The work-holding fixture is mounted on a precision index table which rotates 180 degrees for easy loading and unloading.

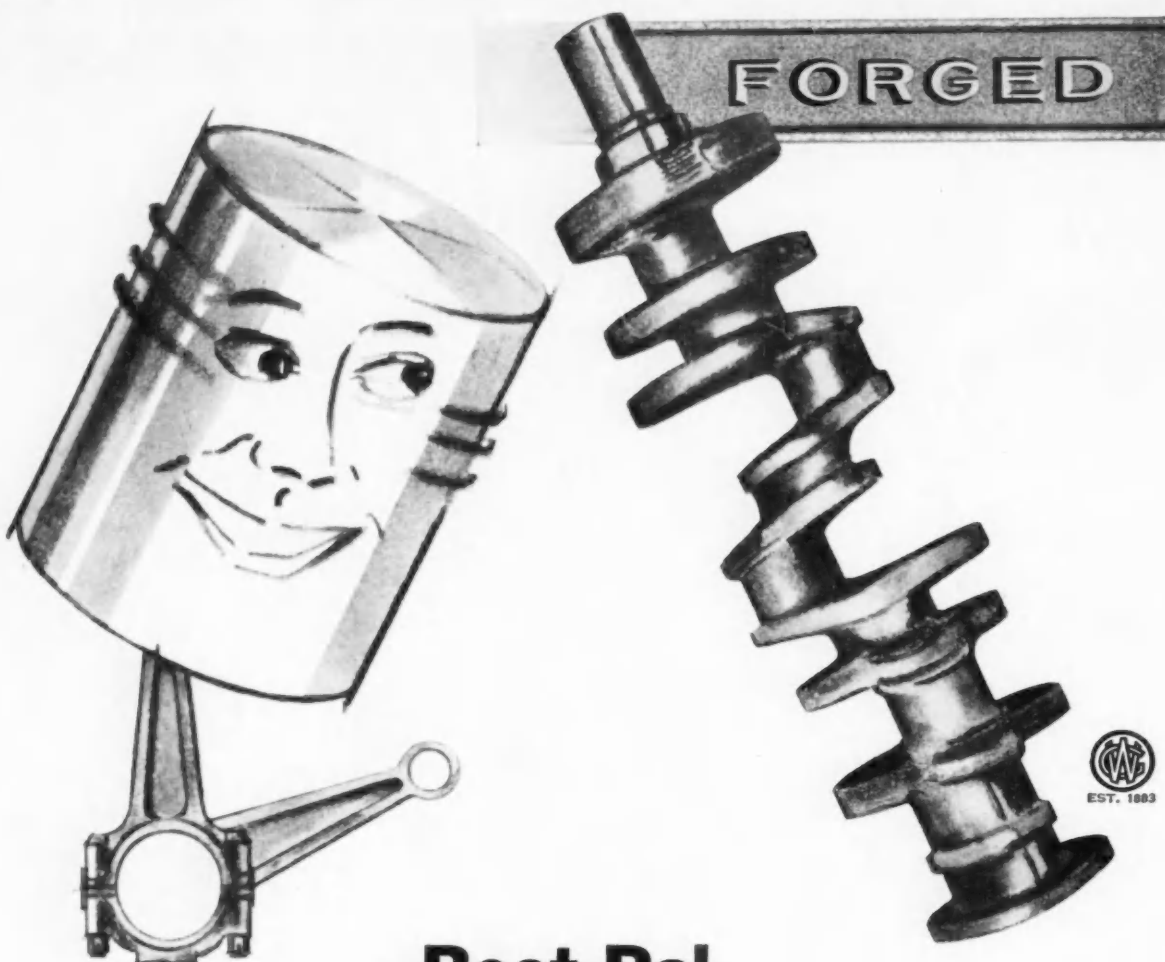


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THE **CROSS** CO.

First in Automation

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Crankshafts have been made successfully by other methods of fabrication and have proven good enough for certain non-critical applications—but for maximum dependability of the modern, compact, high-compression, high-torque, heavy-duty engine a forged crankshaft is essential.

In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

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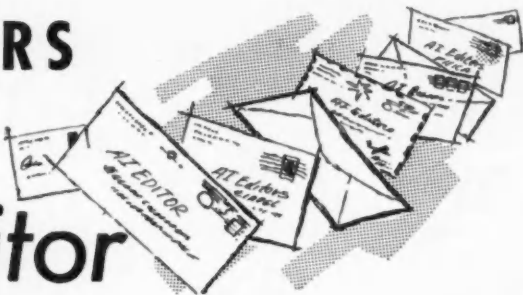
FRANKLIN PARK ILLINOIS

LOS ANGELES CALIFORNIA

LETTERS

to the

Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of **AUTOMOTIVE INDUSTRIES** are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, **AUTOMOTIVE INDUSTRIES**, 56th & Chestnut Sts., Philadelphia 39, Pa.

AI STATISTICAL ISSUE

Three copies of the tire and brake data covered on page 135 of the Statistical Issue would be of considerable value to us for ready reference purposes.

S. R. Yerge
Estimating Supervisor
Charlevoix Plant
The Budd Company
Detroit, Mich.

• Data has been sent—Ed.

AI PLAUDIT

A somewhat belated, but nevertheless sincere compliment on your story about Autolite that appeared in the February 1 issue. I understand that we are obtaining reprints for distribution.

Glenn Campbell
Director of Publicity
Autolite
Toledo, Ohio

AI PLANT CENSUS

Will you please advise me where we can secure a list of all manufacturers of trucks and buses in the United States, with some indication of the size of the company either in sales volume or number of people. We would also like to find a list of all bus operators in the U. S.

Paul G. Wellenkamp
Engineering Manager
Stratos Division
Fairchild Engine & Airplane Corp.

• **AUTOMOTIVE INDUSTRIES** publishes a *Plant Census* directory each year listing, by state, the various manufacturers and their plants that are producing cars, trucks, buses, trailers, en-

gines, tractors, self-propelled farm and construction equipment, and aircraft.

The number of production workers is indicated in connection with each plant and also the capitalization is included in certain cases. The product manufactured is also listed along with the names and titles of key operating officials.

The new *Plant Census* directory for 1960 is now being compiled and should be available around May 1. The price will be \$100.00 per copy.—Ed.

MARINE ENGINES

We particularly liked the position given to our new V-345 engine in your recent article on marine engines. You may be interested to know that we have already had several inquiries from the field which originated from your story.

R. C. Bolling
President
The Palmer Engine Co.
Cos Cob, Conn.

REPRINTS

The article "Autolite Moves Ahead" which appeared in the February 1 issue of **AUTOMOTIVE INDUSTRIES** was well written and well received.

Would you please obtain a cost for 2,000 reprints.

L. J. McGrady
Advertising Manager
The Electric Autolite Co.
Toledo, Ohio

• Quotation for the reprints is on the way.—Ed.

Southern SPECIALIZES in



Standard Fasteners for METAL

Whether your fastener requirements call for steel, brass, silicon bronze, aluminum or stainless steel, Southern Screw specializes in first-quality standard fasteners for metal applications.

If your specifications are for cadmium, zinc or nickel plated finishes, Southern's own plating department can plate your order overnight if desired. This service can mean substantial savings in time and money, eliminating extra expense where fasteners are made in one location and shipped elsewhere for plating. More important, Southern plating assures your order of constant quality control from manufacture through shipment.

Order today from Southern Screw's inventory of 1,500,000,000 quality fasteners. The specials you need may be in our stock as standards. For super service on fine fasteners, address: Southern Screw Company, P. O. Box 1360, Statesville, N. C.

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Circle 111 on Inquiry Card for more data

Earthmoving muscles from tubes of steel

A construction site springs to life as earthmoving equipment tugs, scoops, heaves and rips away at the earth's skin. It's grueling work!

That burly dozer. It's precision built! It's strong! Its massive blade can tear the side out of a hill. Yet, it's nimble, too. In spite of a crab-like figure, it can stop with a jolt, back off, spin, dig in and charge with the force of a galloping rhinoceros.



Power is jammed into these machines. That's why they're built with the toughest, most durable materials in the world. For years, leading manufacturers have chosen USS National Seamless Mechanical Steel Tubing for hydraulic cylinders, tractor pins, bushings and more than 100 other vital parts in earthmoving, rockmoving, grading and all types of heavy mobile equipment. *Why?* Because National Seamless Tubing is ideal for the fabrication of machine parts subject to bruising performance and long wear.

USS National Seamless Mechanical Steel Tubing is another product from the world's largest manufacturer of tubular materials. For more than 80 years, National Tube has been foremost in building and industrial pipe applications. For more information, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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United States Steel Supply Division
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Your dependable high grade machines deserve **MECHANICS Roller Bearing UNIVERSAL JOINTS** dependable high quality. And now you can benefit from the protection and convenience of "once-a-season" or "lifetime" lubricated



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Photo courtesy SKF Industries, Inc.



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For critical applications such as anti-friction bearings, SKF requires steel of chemical and structural uniformity and unusual cleanliness. Minimum size and minimum frequency of non-metallic inclusions are also essential.

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COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

NEWS

Vol. 122, No. 9

May 1, 1960

U.S. Buyers Confused 6 New Lines to Add to Public's Perplexity

By **Hugh C. Quinn, Detroit Regional Editor**
and **C. B. Campbell, News Editor**

The American car buyer must be slightly confused. In the last 18 months our native automobile industry has abandoned three automobile lines and added six completely new lines. And in the next 18 months, Detroit will augment the confusion with no fewer than six more new lines, with perhaps two oldtimers weeded out.

Gone are the Packard, Studebaker and short-lived Edsel. New on the scene are Falcon, Corvair, Lark, Valiant, Comet and Dart. And coming soon are four new compacts, a luxury sports car and a small "compact compact."

Entirely New Line-Up

The result: an entirely new line-up of the traditional price categories by which the consumer has identified car names for years.

Ford, Chevrolet and Plymouth once were the "low-priced three," the basic transportation for the masses. Livered chauffeurs drove mostly Cadillacs, Packards, Chryslers and Lincolns, the prestige cars of status. And anything in between

these two groups was known as "medium-priced."

The new line-up reads like this:

Low - priced: Corvair, Falcon, Valiant, Comet, Lark, Rambler American and Rambler Six.

Lower medium - priced: Ford, Chevrolet, Plymouth, Dart, Rambler Rebel V-8 and Ambassador.

Upper medium-priced: Buick, Pontiac, Oldsmobile, Mercury, De Soto, Thunderbird, and Dodge Matador and Polara.

Luxury - priced: Cadillac, Imperial, Chrysler, Lincoln and Continental.

These are, of course, general as-

SAVIANO SCAT INTRODUCED



This all-new two-door, four-passenger utility vehicle has been announced by Saviano Vehicles of Warren, Mich. It is powered by a 25 hp air-cooled front-mounted engine and attains 50 mph when teamed with a straight transmission.

SKODA HARDTOP HAS DETACHABLE ROOF



Resin-bonded fiberglass section of roof of Skoda Felicia hardtop is detachable. The one-piece molding with glass and interior trim weighs 60 lbs. It is powered by a twin-carburetor version of the Skoda Octavia 66-cu in. engine which develops a maximum 53 hp at 5600 rpm.

signments. The Lark V-8 Regal, for example, might fit best with the low-medium group. But since the bulk of Lark sales are in the three series below the Regal V-8 Lark is classed as low-priced.

Could Split Chrysler

Or perhaps Chrysler should be split between upper-medium and luxury class. The 122 in. wheelbase Windsor could be classed as upper-medium, but the Windsor no doubt feels more at home with the Saratoga, New Yorker and 300-F in the luxury class (polite way of saying high priced).

Ford, Chevrolet and Plymouth have been forced into the medium-price field by the brash young newcomers. So the old-line stalwarts of the medium-price field—Dodge, De Soto, Mercury, Buick, Oldsmobile and Pontiac—have been pushed up a notch. Since they cannot very easily join the luxury field, these oldtimers have forced the medium-price field to subdivide into "lower" and "upper."

This upward pressure will increase, since four new compacts will join the fray as '61 models. These will come from Dodge, Buick, Pontiac and Oldsmobile. A four-passenger, 96-in. wheelbase "compact compact" will be introduced by Ford in 1962, further complicating the picture (see story, next page). And Cadillac is expected to bring out a T-Bird type sports car.

Such specialty models as the Ford Thunderbird don't help to

clarify things. Here is Ford, sometime leader of the low-priced field, competing in price with the Buick Electra, Mercury Park Lane and Olds 98. And when Cadillac brings out its sports car will that mean that Cadillac is challenging Ford? Probably.

Despite persistent rumors, there will be a 1961 De Soto, but a model beyond that is uncertain. And while Ford Motor Co. is retaining the Lincoln name, this long-established prestige car is, in effect, being dropped in favor of a single Continental (see AI, March 15).

Willys Affiliate Making New Auto

A new, medium size automobile, the Bergantin, is being produced in Argentina by Industrias Kaiser Argentina, an affiliate of Willys Motors, Inc.

Built specifically for travel over South American roads, the Bergantin combines the chassis and engine features of the Willys "Jeep" and the design of an Alfa Romeo body.

Powered by a new four-cylinder 76 hp engine, the four-door sedan carries five or six passengers. The over-all length of the 2800-lb economy car is 173 in. It has a wheelbase of 103.3 in.

IKA also manufactures "Jeep" utility vehicles and Kaiser Carabela passenger vehicles at its Cordoba, Argentina, plant.

Chrysler Receives Army Truck Order

Chrysler has received a \$10.8 million Army contract for 2500 three-quarter-ton trucks. Production of the four-wheel drive vehicles is slated to begin next summer at the Dodge truck plant in Warren, Mich.

Chrysler, incidentally, delivered the first production model of the new M-60 tank to the Army April 21 at the Chrysler Delaware defense plant, Newark, Del. The tank was completed 19 months after Chrysler received the initial design and engineering contract from the Ordnance Tank Automotive Command.

The M-60 medium tank is powered by a new 750 hp Continental diesel engine which gives 40 per cent more range and greater fuel economy than its predecessor.

Dr. Wright to Retire

Dr. Theodore P. Wright, former chairman of the Civil Aeronautics Administration, will retire July 1 as vice president in charge of research at Cornell University. Dr. Wright joined Cornell in 1948. He also is board chairman and former president of the Cornell Aeronautical Laboratory and is president of the Cornell Research Foundation.

Goodrich Test Track

B. F. Goodrich Co. is planning the world's largest high-speed tire test track at Pecos, Tex. It will be 24 ft wide, nine miles in circumference and will have two lanes. Ground will be broken about June 1 and tests should begin late this year.

Ford to Build Engine For New Auto in Reich

The society pages said Henry Ford II was spending the Easter holidays with his family in Vienna. The grapevine said he was securing final arrangements for the manufacture of a new four-cylinder engine, and perhaps more, for Ford Motor Co.'s 1962 96-in. wheel-base, four-passenger auto (see AI, Dec. 15, 1959).

The front-wheel drive car, according to latest reports, will be called the Cardinal, not the Hummingbird. Another decision: the V-4 engine will have a cast iron block, rather than aluminum. The engine will be built in Germany and is expected to have about 90 cu in. displacement and deliver 50-60 hp.

A decision on whether to build the entire power unit—engine, transmission, differential, steering unit—in Germany was expected within the next week. The body will be built in the U. S. and the car will be assembled here. Progress on body development indicates it will not be ready for introduction next fall, as rumored earlier.

Lower labor costs no doubt are the reason for the decision to build part of the car in Germany, where auto workers average about \$1.09 an hour less than U. S. workers.

Colbert Confirms Lancer Compact

L. L. Colbert, Chrysler president, added his stamp of affirmation to reports of another compact car slated for introduction next fall. At the corporation's annual meeting in Detroit, Mr. Colbert said, "We have developed another attractive compact car that will be brought to market by our Dodge dealers with

introduction of our 1961 models."

Thus ended another wave of speculation that was more general knowledge than conjecture.

The car is to be known as the Lancer, revival of a Dodge series designation used a few years ago. The Lancer will be built on the Valiant body, but it will have its own front-end sheet metal treatment. The rear deck simulated tire mount now seen on Valiants will not show up on the new Lancer.

There are strong indications in Detroit that the Lancer will be powered by an aluminum block version of the 170 cu in. slant six. But there's still a lively difference of opinion on this matter.

AMC Aluminum Engine

American Motors has given its go-ahead to an aluminum six-cylinder engine for introduction on the 1961 Rambler six. The engine, as reported in AI Dec. 15, 1959, will be an OVH in-line six with 120-125 hp. Cast iron sleeves will be used in the die cast aluminum block. Doehler-Jarvis will begin casting blocks in June.

Motorboat Sales Near \$300 Million

Motorboat sales in 1959 totaled nearly \$300 million, a 34 per cent increase over 1958, according to a survey of the National Association of Engine and Boat Manufacturers.

A survey of 400 boat builders revealed an over-all boat sales volume of \$216.2 million in 1958, or 41.6 per cent of industry activity.

By applying this percentage to 1959, an over-all sales figure for the 400 builders was computed at \$290 million for last year.

Renault Production At Record High

Renault, France's largest industrial organization, produced a record 515,111 vehicles last year, an increase of 19.6 per cent over 1958 output.

In 1959, Renault exported 285,494 vehicles, or 57 per cent of its production. Of this total, 118,051 Renaults were manufactured for the U. S. market. Thus, for the second straight year, the U. S. was Renault's biggest overseas customer.

ALLIS-CHALMERS NEW FRONT END LOADER



This four-wheel drive TL-12 front end loader has a carrying capacity of 4000 lb. It features four-speed Tractomatic transmission. A lever on steering column controls both forward and reverse movement without shifting gears.

NEWS

CONTINUED

Schrader's Overseas Plant Expansion Meets Increasing Demand for Products

The challenge of fast-changing global economic needs and new marketing patterns is being successfully met by A. Schrader's Son, world's largest manufacturer of tire valves and inflation equipment, by a dynamic overseas expansion program. Schrader is a division of Scovill Mfg. Co.

In an effort to solve various problems and to evaluate the expansion program, Russell C. Flood, general operations manager of Schrader and a Scovill vice president, recently embarked on a two-month, 35,000 mi. global tour of Schrader manufacturing facilities.

His first stop was Elizabeth, Australia, where he made final production arrangements at a new plant scheduled for completion in July. Other visits are planned to a newly-acquired factory at Pontarlier, France, and Schrader installations in Birmingham and Cannock, England, and Jacarei, Brazil.

Founded in New York in 1844, Schrader has been the prime source of tire valves, replacement cores, and inflation equipment since the early days of motoring.

The first Schrader tire valves were produced for bicycles in 1891. The first single-unit replacement core was developed in 1898. The Schrader-designed tire valve has been the world standard for more than 36 years.

As early as 1915 Schrader began to shorten the supply lines to its tire, auto, and service equipment customers when it opened a branch factory in Toronto. By 1933, a branch was built in Birmingham, England. Last December, Schrader obtained a controlling interest in Edouard Dubied & Cis, S. A. in France, one of Europe's oldest tire manufacturers.

Schrader has learned that quality control can be assured by "plant packaging." By this method, the complete overseas plant is assembled, manned, and put into operation in New York. Thorough pre-testing of the installation is done before the machinery is shipped overseas. To prevent deviation from the quality level, key production personnel who staff the "package plant," and their families, also are transplanted to the overseas location.

Safety Group Spent \$1.6 Million in '59

The Automotive Safety Foundation spent nearly \$1.6 million in 1959 for traffic safety and highway engineering programs. The ASF made 33 grants totaling \$707,550 during the year to 27 national organizations working on highway safety projects.

Included were \$129,000 to the National Safety Council; \$141,000 to the Auto Industries Highway Safety Committee; \$95,250 to the Yale University Bureau of Highway Traffic; \$67,500 to the Northwestern University Traffic Institute, and other grants for research, training, education and other programs.

Diesel Engine Added To GMC Truck Line

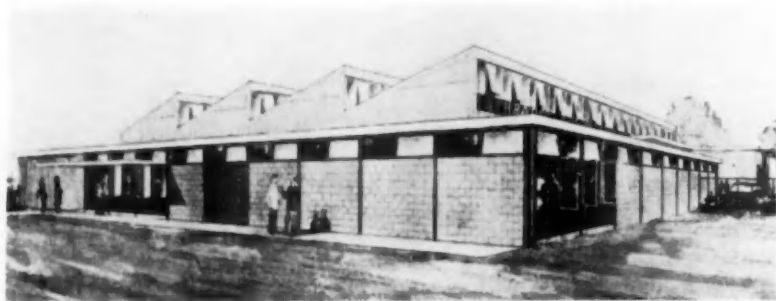
Another V-8 diesel truck engine has been added to GMC Truck & Coach Div.'s "V" type engine family.

The new, two-cycle 8V-71 diesels will be installed in three heavy-duty GMC tractor models this year. The models will be 48-in. BBC aluminum tilt cab design. The single axle model, DF7100 and tandem axle model DFW7100, will have conventional leaf springs, while the DFR8100 will have air suspension. All are rated at 76,800 lb. G. C. W.

Ford's Cavalcade Of Farm Equipment

Ford's Tractor and Implement Div. will use "showmanship and creative marketing" to show some 120,000 persons in 24 cities where the American farmer is going during the decade ahead.

The showmanship plan: a cavalcade of farm and industrial equipment displayed in a geodesic dome equipped with wide-screen projection, "living sound," live equipment demonstrations and a musical show with a Broadway cast.



Artist's view of Schrader's Australian plant

Another new development using

B.F. Goodrich Chemical raw materials



Windlacing woven of filaments of Geon and cotton around sponge rubber core is produced in 26 colors by Schlegel Manufacturing Co., Rochester, N.Y. Filaments extruded by Polyarns, Inc., Canandaigua, N.Y. B.F. Goodrich Chemical Company supplies the Geon vinyl.

HOW 1960 FORDS KEEP OUT THE COLD *... use windlacing woven with Geon*

The weather seal and trim inside this car's door is a new kind of material—windlacing woven with filament made of Geon vinyl.

Because of the unusual abrasion resistance of Geon, this windlacing will wear far longer. It can be made in colors that match upholstery exactly—and the color will not fade or bleed into adjacent materials. The beauty will not be marred by constant exposure to sunlight. And—unlike previous materials used—

Geon is unaffected by water. It is easy to clean—will not retain dirt like other materials.

Here is another example of how Geon is helping to improve products for automobiles—one of the many products made from Geon in 1960 cars. If you want information on improving products—or opening up new markets—with vinyl, why not write today to Department GT-3, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15,

Ohio. Cable address: Goodchemco.
In Canada: Kitchener, Ontario.



B.F. Goodrich Chemical Company
a division of The B.F. Goodrich Company



GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers



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Twin-action gives this Tinnerman "U" **SPEED CLIP**® extra holding power in fastening together two sheets of metal, plastic or wood without screws... the heat-treated spring steel tension in the "U" exerts a clamping action... the tiny upset barbs bite in and hold on for keeps.

Cost of assembly is substantially reduced when you use Tinnerman "U" Clips for fastening... extra assembly steps are eliminated... no special tools or skills are required... and Tinnerman "U" Clips hold for good!

SPEED NUT Brand "U" Clips are easy to apply... merely thumb-push them over the edges of the panels. A variety of Tinnerman fastener features can also be incorporated with the "U" Clip principle... cable clips, protruding legs to hold glass panels in lighting fixtures, and others.

Call your Tinnerman **SPEED NUT** representative today... if he's not listed in your "Yellow Pages" Directory under "Fasteners", write direct.

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NEWS

FEATURES

311 Models Displayed At Huge N. Y. Show

By C. B. Campbell
News Editor

Foreign auto manufacturers, in an effort to retain their slipping American market, staged their largest and most diversified International Automobile Show April 16-24 in New York City's Coliseum.

Eighty-six makers displayed 311 models ranging from the smallest compacts to luxurious limousines. All American compacts were represented along with medium and high priced models.

Latest figures show only Volkswagen and Renault sales are above last year's and observers believe the imports will sag even more when Detroit produces additional medium compact models later this year. Among compacts planned for fall are those of Dodge, Buick, Oldsmobile and Pontiac.

Volkswagen sales so far this year are 68 per cent ahead of the same 1959 period. March sales were 11,500 autos and nearly 3000 commercial vehicles. The same figures



Austin 850 sedan has crosswise motor

prevailed in January and February. Volkswagen officials anticipate 180,000 U. S. sales this year as compared with 150,000 in 1959.

Renault's sales through March were between 25 and 30 per cent over last year. So far this year Volkswagen and Renault have taken about 43 per cent of the import market. Volkswagen is selling between 11,000 and 12,000 cars

monthly, Renault between 6000 and 7000 a month. The other three of the leading five—English Ford, Opel and Fiat—are selling about 2000 each per month.

Among models making their debut at the show which attracted most attention were Borgward's Big Six sedan, the Volvo P-1800 sports coupe, the Amphicar, which travels on both land and water; France Jet, a \$1500 sports car; Austin 850 and Morris 850, Toyopet Tiara sedan; and two Renault trucks. The latter are expected to give Volkswagen trucks a run for their money.

Descriptions of new models follow:

Austin 850

This front-wheel drive English import has a four-cylinder engine mounted crosswise. Only 10 ft long, it seats four adults. The entire transmission is directly beneath

(Turn to page 25, please)



Big Six sedan is Borgward Group's latest

AI TABLOID AI

Storage battery manufacturers shipped products valued at \$369 million in 1958, a 7 per cent increase over 1954. Average employment in 1958 showed a 5 per cent decrease from 1954.

* * *

The coming of warm, humid weather means mold and mildew problems for many industries. A novel fungicide that can be applied by painting or dipping has proved to be one answer. Field tests have established that copper-8-quinolinolate, made soluble with 2-ethylexoic acid and other high-purity ingredients, will work effectively and safely. Satisfied users include the armed forces, food processors, dairymen and brewers.

* * *

Millions of gallons of hydrolubes are being used in an ever widening circle of industries. Basic metals, die casting, metal fabrication, automotive and aircraft industries are among the many users of synthetic fluids.

* * *

A highly practical process for machining hard-to-cut metals by electrical discharges is described in a report on Army research published by the Office of Technical Services, U. S. Department of Commerce. Another report issued by the same bureau explains the advantages of using a high-intensity carbon arc for materials testing.

* * *

The effects of radiation on aircraft lubricants, solid catalysts, and magnetic and ferroelectric materials are evaluated in three Air Force reports released to science and industry.

* * *

Four sections of the Navy's Bureau of Yards and Docks engineering manuals on electric power generation and distribution have been published for sale to the public. They include reports on mobile emergency power plants; fuels; power plant water conditioning and distribution of steam, high-temperature water and compressed air.

The deficit in the U. S. balance of international payments last year was \$3.7 billion, about \$300 million more than in 1958, the Department of Commerce has announced. The 1959 deficit does not include the \$1,375 million payment of our additional capital subscription to the International Monetary Fund.

* * *

Cash dividend payments by corporations issuing public reports amounted to \$420 million in February, about nine per cent above the same month last year. February is traditionally a month of light dividend disbursements and in past years accounted for about three per cent of the annual total.

* * *

An accurate spectrographic method for analysis of zinc-base die castings is described in a research report recently released by the Army's Picatinny Arsenal. Also available to industry are reports on studies of the effect of temperatures on the magnetic properties of various iron alloys, and another on strengthened titanium alloys for high temperature use.

* * *

The U. S. is still far ahead as leading supplier to its most important Latin American markets, but recent trends indicate this dominant role may be weakening, the Department of Commerce reports. Markets for U. S. products appear to be changing from consumer to capital goods as Latin America continues its industrial development.

* * *

Results of five years of study of the short-time tensile properties of structural metals are reported in an Air Force publication recently released to the public and industry. Two other reports, one of stress distribution in a plate with a hole subjected to axial load and creep, and another on creep deformation in a single riveted joint, also are available.

Parts Standardization Means Huge Savings

Standardization of aircraft and missile parts recently adopted by the Department of Defense will effect huge savings and improved procurement efficiency.

Developed by the Aerospace Industries Association National Aircraft Standards Committee and the Defense Department, the parts standards will apply to all services, their contractors and the aerospace industry.

While it is difficult to estimate the tremendous savings effected by standardization, some aerospace officials say it will run into billions.

Firestone Making 39-Inch Tire Rims

Thirty-nine in. diameter rims for large earthmoving equipment are being produced by Firestone Steel Products Co.

The new large rim has been developed for high load capacity construction equipment now in design stages. The rim assembly weighs 829 lbs. and is made of hot rolled steel.

The 39-in. rim results from equipment manufacturers' efforts to increase pay load of dirt-moving rigs. The new rim and tire have a 3,750 lb. greater load capacity than the previous standard 33-in. tire and rim.

New Aluminum Alloy Called Brightest

Reynolds Metals and McCook Sheet and Plate Works have announced a new aluminum alloy said to be the "brightest, most corrosion resistant" alloy available for automobile trim. Reynolds says Alloy 5657, as it is called, will take two to three times more protective coating and still be as bright as any commercial alloy now available. The company says comparison tests show the new alloy, with a 0.2 mill anodic coating, is 15 per cent brighter than the widely used Alloy 5457.

NEWS

FEATURES

CONTINUED

(Continued from page 23)

the engine with the four-speed synchromesh gearbox in the engine sump. Lubrication of engine, transmission and final drive is accomplished in a single operation through a common filler pipe.

Jaguar 3.8 Sedan

This luxury model is of modest dimensions with an over-all length of 180¾ in. It is powered by the Jaguar 3.8 litre, twin overhead camshaft, dual carburetor engine.

Citroen DS-19 Prestige

Another model for the wealthy, this four-door sedan has an intercom system between the chauffeur's seat and rear compartment. There

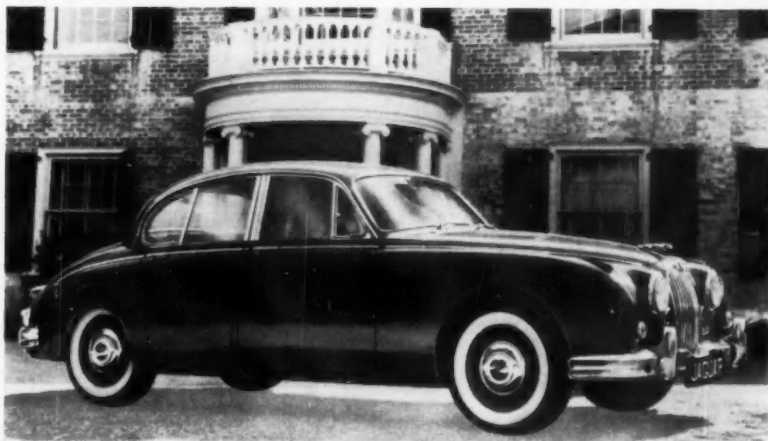


Ingenious Amphicar travels on land or water

are reading lamps for the master or madame. Provision has been made for installation of radio and telephone.

Amphicar

This amphibious vehicle created quite a stir among spectators. It is described as 85 per cent auto and 15 per cent motorboat. It can be driven on land and directly into water where it operates as a boat. The West German model is powered by an Austin four-cylinder engine. On land it operates with a four-speed transmission. When entering the water, a switch lever operates two propellers for forward or reverse.



Jaguar's stylish 3.8 four-door sedan

Tatra Sedan

This Czech model has a compact 108 in.-wheelbase with an all-aluminum, V-8 rear mounted air-cooled engine rated at 95 hp. It has independent coil spring suspension on all four wheels. Tatra, a well-known car in Europe, has successfully used aluminum, rear-mounted engines for 20 years.



Rolls-Royce Phantom 5 has aluminum engine

DAF 600

The only automobile built in Holland, this five-passenger sedan features automatic clutch and "Variomatic" transmission which provides a number of ratios. Its two-cylinder, air-cooled engine requires no differential. It is 142 in. long and has an 81-in. wheelbase. Each wheel is driven by its own V-



SAAB Series 95 station wagon



Tatra V-8 has air-cooled engine



XP-700 Corvette, Chevrolet's test model



Citroën's DS-19 Prestige four-door sedan

belt and the makers claim each wheel can adapt itself freely to any surface condition.

SAAB Station Wagon

Here is a wagon with a three-cylinder, 38-hp engine with four forward speeds. The wheelbase is 98 in. and over-all length is 162¼ in. It weighs 1984 lb. Built in SAAB's jet plane factory, it is still being tested before it goes into production.

Renault Trucks

The Petit-Panel and Hi-Boy have front wheel drives and are only 14 in. from the ground. Only 161 in. long, they weigh 2150 lb. They have unitized chassis and coil spring suspension with front and rear inside mounted shock absorbers. They are powered by a four-cylinder, 32-hp engine through a synchronized transaxle unit. The trucks' design permits both side and rear loading. They have a turning radius of only 15 ft. Inside height of the Petit-Panel is 60½ in. The Hi-Boy, with a raised plastic roof, is 72 in. high.

Borgward Big Six

This four-door sedan features independent suspension on all four wheels with coil springs all around. Wheelbase is 104.3 in., length, 185.6 in. and weight, 2755 lb. The 136.6 cu in. engine develops 100 hp.

Toyopet Tiara

A four-door, four-passenger "smaller than compact," the Tiara has been specifically designed to compete with the economy models in the U. S. market. It has a unitized body and torsion bar suspension, and apparently will find favor with lovers of foreign mites. The Japanese, always mindful of the little things, have attached the gas tank cap with a nylon cord so it cannot become lost.

NEW

FEATURES

CONTINUED

Electronic System at Oldsmobile Plant Speeds Pick-Up and Delivery of Parts

Pick-up and delivery of parts and accessories at the new Oldsmobile warehouse in Lansing, Mich., are speeded by a unique electronic trucking system of six special Guide-O-Matic tractors and 150 trailers made up into "trains." The "trains" are guided by radio control along a prescribed course by a copper wire recessed in the center of concrete aisles.

Without operators, the "trains" move systematically on pre-set routes throughout the manufacturing areas, stopping at intersections to allow other trains to pass and

resuming their journey to a point designated by a dispatcher. A dispatcher selects a loading or unloading point by setting two dials on a tractor control panel.

Speed is held to two or three mph while maximum loading is 4000 lbs. per trailer or 16,000 lbs. for a four-trailer "train." Each tractor has a bumper bar which will bring the entire train to a full stop if contacted by any obstruction weighing two lbs. or more.

The dispatcher can send a train to any one of 21 stations in the warehouse. If new loading stations

are required, the guide wire can be laid where needed and synchronized with the present system.

In the future, manually operated tractors will be employed only for loading and unloading the trailers. At the same time, the electronically-controlled tractors may be driver-operated in any emergency.

The tractors are operated by 24-volt batteries which are recharged on the night shift. At the end of a work day a button is pushed to send each train to the recharging station.

Oldsmobile Stresses Design Reliability

Oldsmobile has established a new department for design reliability to go beyond the normal functions of quality control. As J. F. Wolfram, Oldsmobile Div. general manager, says, the new operation will make full use of existing programs in product planning, designing, testing, metallurgy, parts procurement and manufacturing.

Named to head the new reliability program is Robert W. Truxell, formerly director of methods and plant layout.

Mr. Wolfram explained that, while quality control deals mainly with actual manufacturing reliability, the new design reliability program also will include planning and design, right through to analysis of customer use. He said Oldsmobile is adapting the all-inclusive approach to reliability that has been brought about by missile and space research.

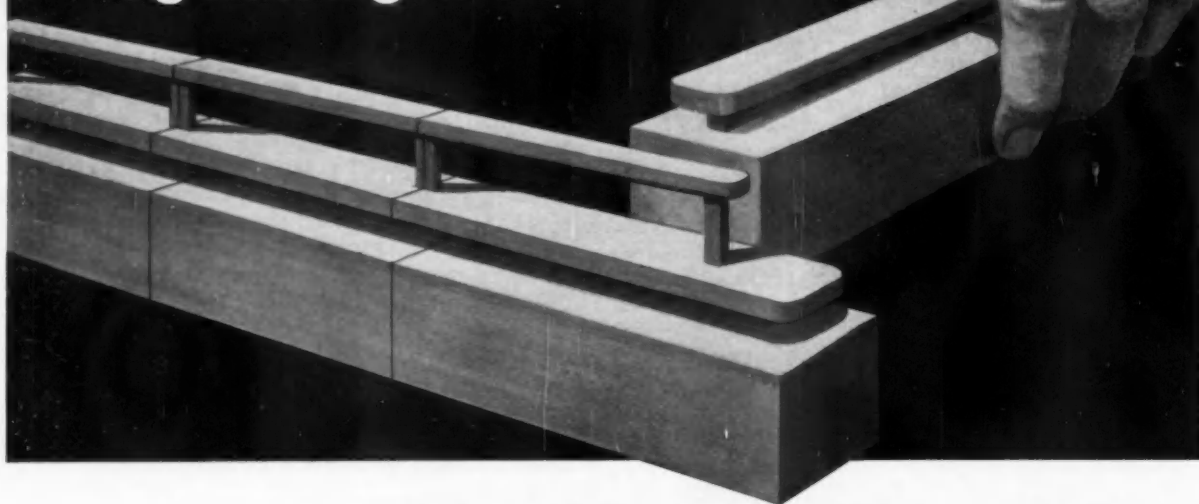
Machine Tool Parley

The 1960 Vickers Production Machine Tool Hydraulic Conference will be held May 17 and 18 in Detroit. Attendance is by invitation.



Unique electronic trucking system

Here's how a complicated
problem was overcome with
engineering know-how



UDYLITE HAD THE ANSWER

PROBLEM: To adapt a full automatic plating machine to the Udylite Bi/Nickel process, which required the addition of an extra nickel plating operation for deposit of semi-bright nickel immediately preceding full bright nickel plate. It was also desirable to gain versatility so the full automatic could be used for either straight bright nickel or the Bi/NICKEL process.

LIMITATIONS: Plant length prohibited the extension of the existing machine at either end.

THE UDYLITE ANSWER: A semi-automatic machine was added at right angles to the existing full automatic. A simple

transfer system was engineered and built to "detour" parts through the semi-bright process in the new semi-automatic machine and back to the full bright process in the automatic.

FLEXIBILITY BONUS: Easily accomplished conversion changes the machine to the Bi/NICKEL plating process or reverses it back to its original cycle for single bright nickel plating.

Udylite engineering ingenuity here proved that it is possible to take advantage of the latest new process developments with inexpensive machine change-overs. You'll find it worth investigating—see your Udylite man now or write directly to—



world's largest plating supplier

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on the west coast: the L. H. Butcher Company

MI E IN

IN THE NEWS

Clark Equipment Co., Industrial Truck Div.—**Leighton E. Campbell** has been named general service manager and **J. M. Squier** has been made service engineering manager.

Hughes Aircraft Co.—**Robert M. DeHaven** has been appointed manager of the flight test division.

Whitehead Metals, Inc.—**James H. Miller** has been elected comptroller and **T. Paul Moore** has been named assistant comptroller.

Clevite Corp., Cleveland Graphite Bronze Div.—**William D. Cameron** has been named general manager.

Walker Mfg. Co., Jackson Engineering Div.—**John C. Walker** has been appointed chief product engineer and **William C. Whitney** has been named administrative engineer.

General Motors Corp.—**Harry D. Hall** has been appointed director of manufacturing development.

Midland-Ross Corp.—**Theodore F. Loughry** has been named manager of foreign operations.

Highway Trailer Co.—**A. Vance Howe** has been appointed vice president of eastern sales.

American Motors Corp.—**V. E. Boyd** has been appointed director of automotive sales operations and **Fred W. Adams** has been promoted to sales manager.

Eaton Mfg. Co.—**Paul W. Olson** has been appointed general manager of the Marion Forge Div. and **George R. Frye** has been promoted to general manager of the Foundry Div.

Ford Motor Co.—**Mark Kaiander** has been named manager of the Buffalo Stamping Plant and **Charles G. Hunter** has been named manager of the Monroe, Mich., plant.

The Budd Co., Automotive Div.—**Frank McCarthy**, **William Krauss**, **Robert Shumate** and **Donald Feidt** have been named regional wheel sales managers.

Electric Autolite Co., Toledo Div.—**Earl L. Pressel** has been named manager.

Chrysler Corp.—**E. H. Thorsby** has been named manager of manufacturing engineering and **Arthur L. Yahrmatter** has been named superintendent of tool and process engineering.

Champion Spark Plug Co.—**W. R. McConaughey** has been named head of the personnel and training section; **M. N. Hanna** has been placed in charge of the market research dept. and **J. E. Neal** has been named to an administrative post in the sales dept.

Hercules Motors Corp.—**Lawrence G. Downey** has been named vice president-sales, and **George W. La Salle** has been named vice president-engineering.

Lindberg Steel Treating Co.—**George H. Bodeen** has been appointed general sales manager; **Stanley Skozek** was elected assistant secretary and **Ronald F. Steward** has joined the metallurgical staff.

Marmoon-Herrington Co., Inc., Oneida Div.—**Richard O. Thomas** has been named vice president and general manager and **Lynn L. Parks** has been appointed sales manager.

Stewart-Warner Corp., Alemite and Instrument Div.—**Walter Schmid** has been appointed manager of manufacturing-engineering and **John Simkus** has been named superintendent of assembly operations.

McQuay-Norris Mfg. Co., Original Equipment Sales Div.—**Robert J. Humbrecht** has been named a Midwestern representative.

Timken Roller Bearing Co., Automotive Div.—**Robert L. Williams** has been promoted to chief engineer. He replaces **Robert M. Riblet**, who retired.

Sealed Power Corp.—**Warren R. Carter** has been named manufacturing manager.

Globe-Union, Inc., Battery Div.—**Arvid E. Halla** has been named eastern regional sales manager.

Garlock Packing Co.—**R. M. Waples** has resigned as board chairman. He will continue to serve on the board of directors.

Necrology

Percy H. Batten, 83, founder of Twin Disc Clutch Co., died April 8 in Racine, Wis.

Raymond G. Largent, 57, secretary and controller of Cessna Aircraft Co., died April 14 in Wichita, Kan.

Leo R. Schreiner, 56, general manager of the Ternstedt Div., General Motors Corp., died April 11 in Detroit.

Gabriel Co., Gabriel Div.—**Earl Ericson** (left) was named plant manager and **Ivar J. Samuelson** was promoted to assistant to the president.



Borg-Warner Corp., Spring Div.—**Arthur J. Welch** has been elected president and general manager.



Minneapolis-Moline Co.—**Stephen M. Reynolds** has been named director of industrial relations.



Judson L. Thomson Mfg. Co.—**Kenneth E. Joy** has been named vice president in charge of sales.



A. O. Smith Corp., Automotive Div.—**N. F. Mullaney** has been appointed manager of rail and advanced products.



Essex Wire Corp., Automotive Div.—**Robert E. Valk** has been appointed general manager of manufacturing.



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- Water Pumps ■ Oil Pumps ■ Shaft Seals

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A Time for Real Economic Insight

an Editorial



WITH THE PUBLICATION OF THE ANNUAL financial reports of the automobile companies and many of their major suppliers, some very interesting facts have been put into circulation. General Motors, Ford and Chrysler combined paid more than \$2 billion in taxes during 1959. The amount paid in taxes was *just double* the amount paid out for total selling and administrative expenses for these three companies. It would be interesting to put the financial statements of all 6000 companies comprising the principal manufacturers of all types of automotive vehicles and components on a Univac in order to find out what was the amount of total taxes paid by all these companies. It could also be determined what ratios exist for taxes versus selling and administrative expenses for the total field.

NOW FROM A WHOLLY IMPARTIAL STANDPOINT, such facts as these may have a lot to do with the question of the future productivity of the industry. Federal taxes have been reduced on business activities in many fields which are not nearly so important to Mr. and Mrs. America as the automotive industries.

THROUGH REVIEW OF THE ANNUAL REPORTS it is also apparent that despite constantly increasing burdens of non-productive costs, the automotive industries have very successfully initiated and advanced in a major battle to improve services to the American Public. Typical spearheads of these actions have included technical and engineering progress in the following fields:

1. The war against corrosion.
2. The battle for increased safety.
3. The war against air pollution.

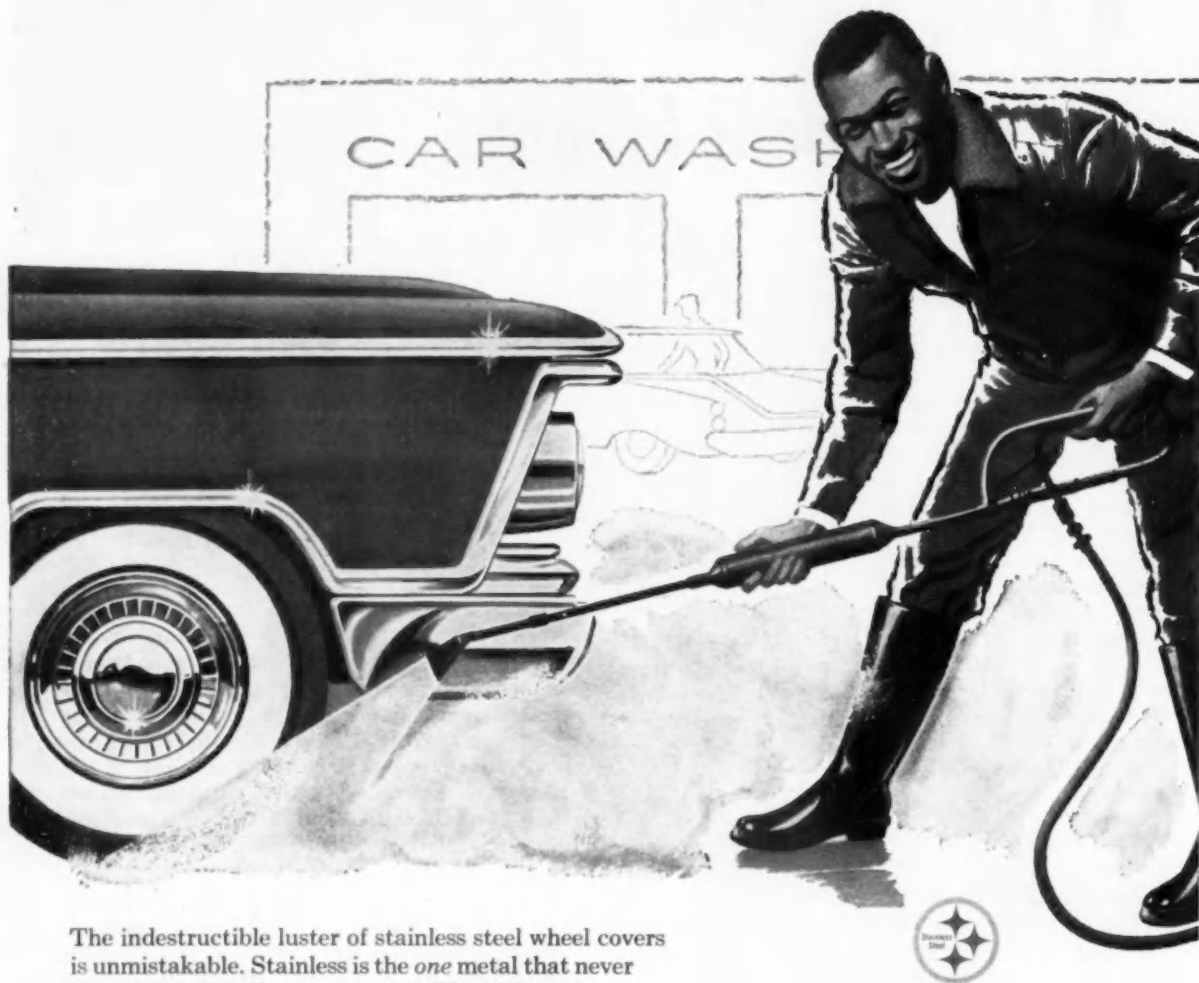
4. The attack on needless sound and noise.
5. The fight for driver and passenger comfort.
6. The onslaught on vibration.
7. The campaign for quality control and reliability.
8. The successful program of expanding world-wide cultivation of International markets.

WHEN THE 1960 ANNUAL REPORTS are published, it will be important for everyone in the industry to re-check the trends of taxes versus selling, administrative and operating costs. During the year, we can call the attention of our friends among the economists, editorial writers, automotive economics analysts and others to the disproportionate and excessive taxation imposed upon the automotive field and upon automotive suppliers. If the tax burden on the industry is so great that it curtails the industry's "ability-to-sell" and if the tax burdens upon consumers are so great that they curtail the consumers "ability-to-buy-and-use" automobiles, trucks, buses, tractors and other internal combustion engine powered vehicles, then this industry is being completely circumscribed by taxation. Such an objective is certainly not the intention of either the American Public or of Congress. Both the Public and Government want this industry to be fully capable of going ahead and winning the wars for progress which have been started. And they also want it to win every additional battle which will help to give every element of American Economic life more mobility, more economy, more safety, and more productivity.

Henry W Barclay

Editor and Publisher

"Man...that Stainless Shines!"



The indestructible luster of stainless steel wheel covers is unmistakable. Stainless is the *one* metal that never betrays a car's mileage . . . or age. The highway's abrasive grit, winter's salted streets, and even harsh detergents and steam can't corrode, etch or dim its beauty.

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GENEVA 1960 SALON

By Albrecht Graf Goertz

Goertz Industrial Design
New York and Munich, Germany



Above: Goertz is widely known for his design of the BMW 507, and other models shown below



Sports touring car with detachable metal top



Four passenger coupe and convertible type BMW 503



Metal top convertible on Cadillac chassis for Motto, Turin

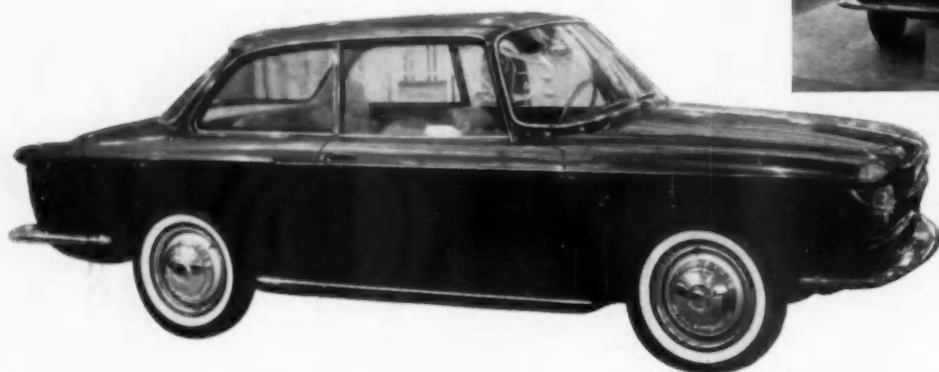
AMERICAN compacts looked better in their European setting at the 1960 Geneva Salon than they appeared in United States showings. I think the United States-made Compacts were more successful than the 1960 big car designs. They appeared to advantage in Geneva because they were shown in the setting of smaller European cars. In that setting, the advantages of U. S. Compact Car driver convenience and comfort were more clearly apparent, than when they were shown in a setting of big cars in their own country.

There are three important points for car designers which were clearly apparent for the first time at the Geneva Salon. These included the following:

1. Some European new cars are being definitely pointed up in design for sale in the American market.
2. Some European car-makers are adopting American manufacturing ideas concerning the "adaptability" of basic car designs to "multiple model" varieties.
3. A real necessity for being competitive has arisen for the European automobile manufacturers. I think the European type of "small-small" car is dying because Europe has started having the same auto driving problems that we have here in the United States; i.e., bumper-to-bumper driving for several hours. Buyers want bigger and more comfortable cars abroad.

The nice thing about the Geneva Show is that this salon is in a country which does not have any car production of its own. Therefore, the difference between the automobile shows in London, Paris, Frankfurt. Geneva is neutral ground and all countries are equally represented, also bigger Italian body builders.

Right and below: Prototype of new Frua body on VW chassis. This is for their Italo-Swiss project



Above and right: Russia was represented by the Moskvich and the Tschaiika-Wolga models



To start out with, the big automotive companies did not show anything excitingly new. There was a continuation of new models to the existing lines, for instance Fiat introduced a station wagon which is a development out of the 2100 Sedan which was shown here last year. The Fiat 1500 which also came out last year has a very attractive hardtop on the Spyder. Lancia showed the same models, so did Alfa-Romeo. This takes care of Italy as far as the big factories are concerned. From France, Renault, Simca, Citroën, showed nothing new. Facel-Vega on their new model the Facellia which was shown first at the Paris Show, now also added a hardtop.

Volvo (Sweden) is the only one with a new sports coupe. Production starts in the fall 1960. From Germany Mercedes, VW, BMW, German Ford, Opel, Borgward did not bring anything new. Goggomobil as a development of the 700 ccm. Sedan, brought out a station wagon. England was represented by Rolls-Royce,

Bentley, Jaguar, Rootes, English Ford, BMC, Triumph. Standard-Triumph was the only one which brought out 2 new models, a convertible and a coupe in their Herald line; a Sedan was shown last year and these are developments out of this. Similar to the BMC lines which are designed by Farina, the Triumph is a design by Michelotti. In both these cases it does not seem too successful as in this Italian-English collaboration the cars are no longer really English nor are they Italian, in character.

The American compacts Corvair, Falcon and Valiant looked particularly good to me in Geneva. And I had an opportunity to talk to three of the best known Italian designers and we all agreed that stylewise the Corvair is really an exceptional car. One of them went so far as to say he wished he had designed it.

Now we are going to look at the specials. Represented were Farina, Ghia, Frua, Bertone, Viotti, Cis-Italia, Abarth, Vignale, Zagato. Cis-Italia, who were

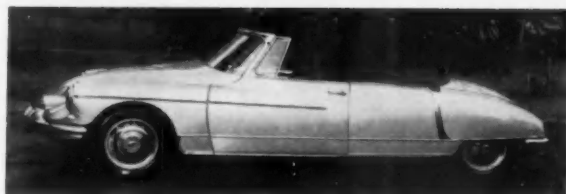


Above: Gaggomobile new station wagon
700 ccm



Above: New Abarth design on 2100 Fiat

Below: The new Viotti coupe on 2100 Fiat



Above: Newest convertibles and hard-top
on Citroen chassis



Center above: The new Facellia hard-top
coupe. Below: A unique prototype racing
design



Above: Cis-Italia showed three types of
bodies on the 750 Fiat chassis—a con-
vertible, a roadster and a coupe



Left: New Volvo sports coupe. Production starts next fall

Below: Farina showed a super-sport Alfa-Romeo 3500 on which he has started limited production



Above: The 1500 Fiat hardtop on Spyder



Right: The new Fiat 2100 Station Wagon

well known in the States for the type 1100 just after the war, have re-appeared on the scene. They showed 3 types of bodies on the 750 Fiat Chassis; a convertible, a roadster and a coupe. I don't believe them to be as successful as their previous model. Abarth instead of only producing specials out of the 600 and 1100 Fiats this time showed developments out of the 1800 and 2100 Fiat with very beautiful convertibles and coupes. Frua is involved in a new venture called Italo-Swiss and they presented a body on the VW Chassis, possibly as a proto-type which is much roomier and quite appealing. My criticism—it is too similar to the Corvair.

Ghia showed among others their conception of a sporty coupe on the Valiant, this is to me a forced solution and no credit to Ghia. Viotti also showed
(Turn to page 90, please)



Above: Beutler, a Swiss body-builder, showed a four passenger Porsche, roomier than previous models



THE GORDON GRAND TOURING CAR



Upper left-hand corner and above: Four passenger Gordon Coupe of new company will use Chevrolet Corvette engine in production next fall



Above: This is a body by Zagato. The chassis is an Alfa Romeo Sprint Speciale



Above: This is a Bertone body on an Alfa Romeo Sprint Speciale



Peerless Motors, Ltd., has planned to produce 25 new Gordon Grand Touring Cars next September in their 1960 manufacturing program using new production facilities expected to be completed in July. The Chevrolet Corvette engine, a 4.6 litre V-8 unit, giving 230 BHP from the normal single carburetor version, will be used with a sporting, 4-speed close ratio manual gear box. Mr. J. D. S. Keeble of Ipswich has designed a chassis "of great rigidity and strength," fitted with disc brakes on all four wheels, featuring twin master cylinders, a novelty outside racing circles, to insure safe and efficient braking. Wheelbase will be 8 ft, 6 in. Overall Height—4 ft, 5 in.

It is planned to use the "de-Dion" rear axle layout, employing coil springs, twin radius arms at each side and a 'Watts' linkage for lateral location. Seating capacity will be for four adults. Carrozzeria Bertone, well known for their production of the Alfa Romeo Giulietta Sprint and Sprint Speciale and also the N.S.U. "Sport Prinz" were commissioned to produce three prototype bodies of the Gordon Grand, the first of which was featured in the Geneva Show. Bertone, in a new large factory at Grugliasco, outside Turin, employs 700 men to make 200 bodies per week. Fulfillment of the first order for a thousand bodies for the Gordon G.T. at the rate of 25 per week, will not take long to achieve once tooling has been completed in late summer, it was stated. Bodies welded to the space frame chassis will be shipped to Slough for final mechanical assembly and testing. Two of the prototype cars now being built are for shipment to the United States. The first car will be a right-hand drive model for test use and demonstration. While firm prices cannot be given the anticipated U. S. A. price will be between \$5,500 and \$6,000 P.O.E.

Left: A three-quarters front view of the new Gordon Coupe which was completed just in time for the show

Expanding Demand for Industrial Engines

By Charles A. Weinert

EASTERN EDITOR

INDUSTRIAL engine activities have been expanding in a quiet, but nevertheless effective way. Significant advances have occurred in sales, product designs, manufacturing techniques, and fields of application—and are expected to continue.

This, briefly, is the picture presented by special reports to *AUTOMOTIVE INDUSTRIES* from 10 manufacturers in the heavy-duty industrial engine industry. The details follow.

Business Trends

From an overall industry standpoint, the volume of business on hand is currently about 25 per cent over that of a year ago. The individual business situations of companies do vary, however. For example:


C. A. Hubert, general manager of Construction Equipment Div., International Harvester Co., says the present volume represents a "40 per cent increase over 1959."

William Kusz, advertising manager, Market Services Department, Caterpillar Tractor Co., reports, "Although our January 1960 engine business volume was up over the same month of 1959, we find some buyer caution developing."

Clyde W. Truxell, general manager of Detroit Diesel Engine Div., General Motors Corp., states, "the highest volume of sales of any year" was achieved in 1959—and that orders on hand and sales forecasts through July "indicate a continuance of the upward trend in 1960."


Inquiry activity is also higher—to the overall extent of about 35 per cent over last year. The responses range from "not markedly higher, but producing more business," and "quite high, but cautious"—to from 15 to 60 per cent higher, and "an all-time high."

Business forecasts for the balance of 1960 predict, as would be expected from the foregoing, a continued rise in sales. Compared to 2nd Half 1959, some say the rise will be as much as 35 to 40 per cent. Others just say they expect "an increase," or "a sharp upward trend."



Two Caterpillar Diesel electric sets are used for static testing of Atlas and other Air Force missiles at Edwards ballistic missile test center in California.

With this petroleum rig, which has four D397 Caterpillar Diesel engines, wheel-mounting of drawworks, mast, engines and pumps on five trailers, together with unitizing of pumps, manifolding and mud tanks, reduces set-up and moving times to the minimum.





Hobart ground support airfield unit powered by GM Diesel represents a relatively new application brought about by the operation of military and commercial jet planes.

Engine Deliveries

According to the respondents, engine delivery time will not increase with any reasonable increase in business volume. A number of the companies have already expanded, or are expanding, their production facilities—and these are considered ample to handle anticipated near-future requirements.

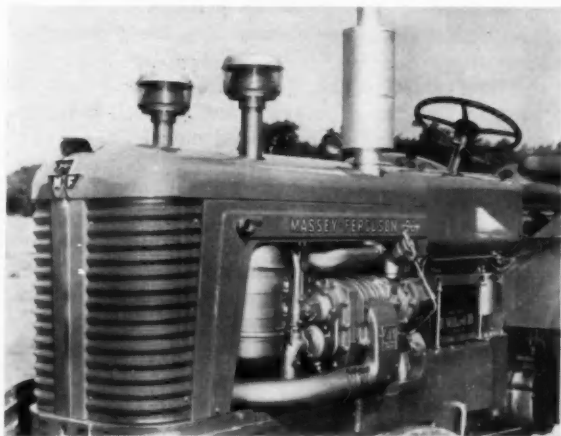
Applications

The places where heavy-duty industrial engines are being applied are numerous and varied in character. Several applications are illustrated.

In the construction field, they are being used in shovels, cranes, rock crushers, and air compressors.

They are being used as standby electric-power units for industrial plants, hospitals, and in the communications and utilities industries, among many

Farming applications of Diesel engines include use in tractors, feed mills, harvesters and irrigation pumps. Shown is a Massey-Ferguson Model 98 farm tractor powered with a three-cylinder GM Diesel engine. GM Diesel power is also used in John Deere and Oliver farm tractors.



other types of electric-power-source installations.

In the petroleum industry, industrial type engines are being applied to drilling rigs, compressors, and pumping units.

In the logging industry, sawmills, power skidders, log loaders, and debarkers are typical applications.

In agricultural work, they are being used in tractors, harvesters and other farm equipment, and for water-pumping in irrigational setups, lighting plants, etc.

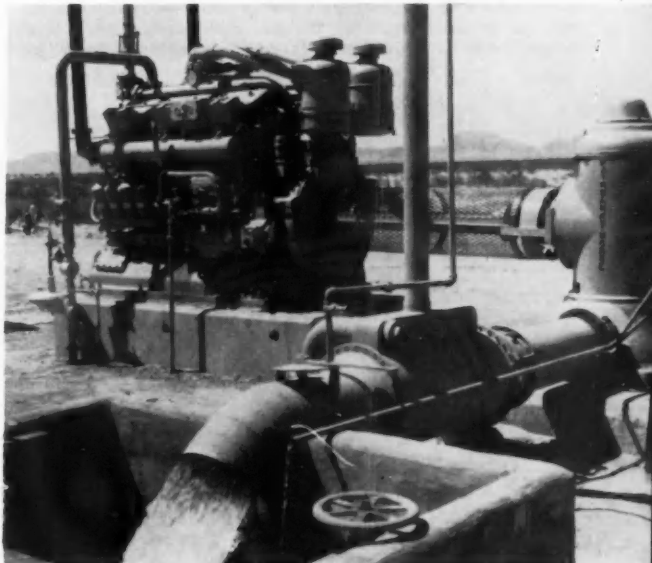
Work boats and fishing boats are further applications.

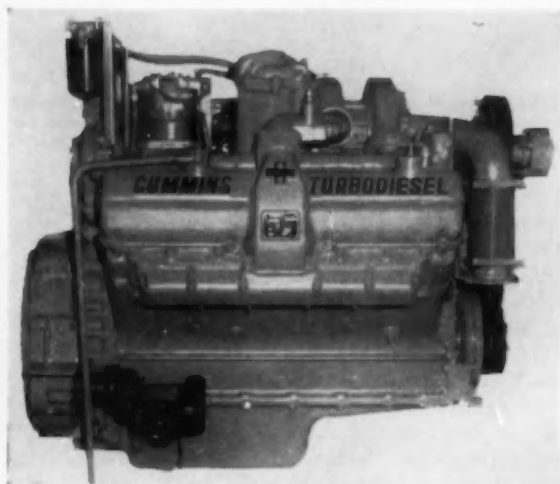
To this list of industrial engine applications can be added a variety of off-the-road vehicles, ground vehicles for missiles and jet aircraft, derricks, refrigeration equipment, locomotives, welders, fork lift trucks, and spraying equipment—without attempting to be all-inclusive.

Design Trends

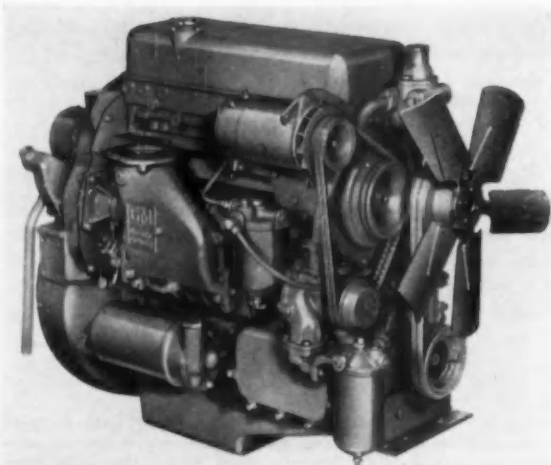
Market demands—as in all other fields where engines are concerned—have resulted in new engine models with higher engine speeds and outputs in smaller, lighter-weight units. Most of the development work in these respects, thinking in terms of heavy-duty applications, has been on Diesels. Turbochargers, for one thing, are being adopted to a

Caterpillar G397 natural gas engine, a V-12 with a total piston displacement of 2493 cu in., pumping water in irrigation project outside Phoenix, Ariz. It handles 3000 gpm with a Fairbanks-Morse turbine pump.

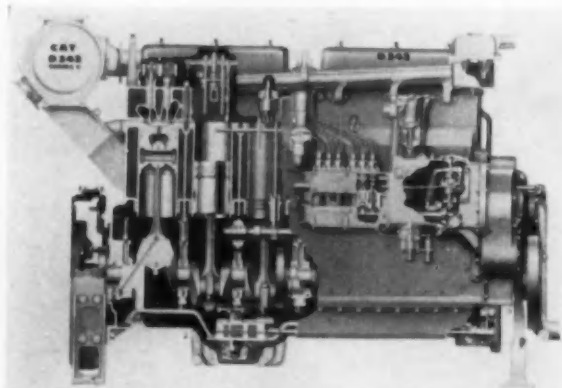




Cummins VT8-430 is a new turbocharged Diesel with a total piston displacement of 950 cu in., rated 430 hp at 2500 rpm. Of the V-8 four-stroke type, it weighs 2970 lb, or 6.9 lb/hp, with standard accessories. Its naturally-aspirated version, designated V8-350, is rated 350 hp at 2500 rpm, and weighs 2940 lb.



GM Diesel's 130-hp 4-53 engine—one of eight basic engines added to the Division's line in 1959—was introduced for use in small highway trucks, small compressors, and other industrial equipment formerly powered largely by gasoline engines.



Caterpillar D342 is a six-cylinder, ohv, four-stroke, turbocharged Diesel having a total piston displacement of 1246 cu in. It is rated 320 hp max. at 1300 rpm.

larger extent generally. Typical of the new engine models are those illustrated.

Three of the engine builders say they will introduce new lines during the year, but that details cannot yet be revealed.

Production Facilities

Several companies have recently made or are making additions to their engine production facilities.

GMC's Detroit Diesel Engine Div., not too long ago, made substantial additions to its plant and installed the most modern manufacturing and inspection equipment.

Caterpillar Tractor Co. has built a new 550,000-sq-ft modern-equipped plant at Mossville, Ill., for industrial engines. In addition, a large new technical center is under construction, part of which will do research work on prime movers exclusively.

Cummins Engine Co. is in process of completing a \$6 million expansion of manufacturing facilities for production of engines for various markets. N. A. Prunsinski, manager of market research, comments, "While the industrial engine market is not the dominant reason for this expansion, it is certainly a contributing factor." He further indicates this expansion will increase Cummins' main plant floor space by 38 per cent.

Willys Motors, Inc., may have to expand engine production facilities. James A. Currie, sales administration manager, says, in this connection, "While it has not yet been necessary to add to the production facilities for our industrial engines, there is a good possibility that, based on anticipated business by the end of 1960, an expansion of our facilities will be necessary."

Cerlist Diesel, Inc., according to Robert C. White, vice-president of sales, expects to make a major expansion in production facilities late in 1960 or early in 1961.

Production Techniques

A number of the engine manufacturers have incorporated major improvements in their manufacturing setups.

As mentioned above, GM Diesel has placed in operation new manufacturing and inspection equipment. It includes tape-controlled machines.

Caterpillar has adopted assembly-line techniques for its big V-8's and V-12's. Engines are assembled on the first portion of a 300-ft moving assembly line. As the assembly progresses, attachments are bolted in place. The continuous-flow process then feeds directly into the dynamometer testing area—and then onto the painting line.

Cummins is "shifting to higher-volume production processing." One recent manufacturing advance consists of broaching—replacing milling.

(Turn to page 64, please)

SAE Aeronautic Meeting

MAJOR developments in the aerospace industry—materials, powerplants, human engineering, fuel cells, measurement techniques, manufacturing methods and exotic materials—were discussed and explored at the SAE National Aeronautic Meeting in New York City.

Highlighted by technical papers, panel discussions, engineering exhibits and award presentations, the week-long program was well balanced and tailored to the interests of industry executives and engineers.

Held at the Hotel Commodore during the week of April 4, the meeting was sponsored by the SAE Aerospace Powerplant, Aerospacecraft, Air Transport and Production Activity Committees with the cooperation of the SAE Metropolitan Section.

A total of 23 technical sessions at which 76 papers were presented by industry specialists held the spotlight throughout the week. Running the gamut from today's turbine engines to tomorrow's nuclear pebble bed reactors, a great number and variety of subjects were reviewed including auxiliary power for space vehicles, facilities planning, reliability, temperature measurement techniques, direct conversion to electricity, turbine and nuclear engines, supersonic transports, VTOL aircraft, high-temperature bearings, and new manufacturing methods.

By Norman Lloyd
MARKETS EDITOR

Classified information on future USAF requirements for materials and processes, air breathing propulsion and high-energy propellants was presented in closed sessions for cleared personnel on Tuesday and Wednesday.

A large audience of over 300 heard A. Scott Crossfield, Chief Engineering Pilot of North American Aviation and X-15 project pilot, speak at a luncheon meeting on Wednesday, April 6. Mr. Crossfield discussed the history of the "manned missile" from its inception through recent powered flights.

Also at the luncheon, presentation of the Laura Taber Barbour Award was made to Mr. Melvin N. Gough, Director of NASA's Atlantic Missile Range, for his efforts in the development of air safety regulations and traffic control procedures.

A formal presentation of the Daniel Guggenheim Medal, presented annually for notable achievement in the advancement of aviation, was made to Sir George Edwards, Managing Director of Vickers-Armstrong Ltd., and chief designer of the Viscount series transport aircraft.

Following are extracts of selected papers presented at the meeting.

works, what its applications are, and its advantages and disadvantages.

Electroslag welding, developed and introduced in production by the Soviets, is a unique process for wrought, forged and cast heavy sections. Theoretically, any thickness can be welded in a single pass, but the reported maximum thickness is 40 in. Welding with the electroslag process is done with the joint positioned vertically—the weld is started at the bottom and moves upward.

Single or multiple wires or plate electrodes are fed into a molten slag bath which rests on the molten weld pool. Initial heating of the electrodes occurs by self-resistance heating effects. Final heating and melting occurs by electrolytic heating in the slag bath. The slag bath and molten welding are held in place by water-cooled copper shoes. An arc is not maintained during welding, but is used to produce the slag and metal baths when starting a joint.

Electrode wires and fluxes are usually identical to similar materials for submerged-arc welding.

Electron Beam welding—parts to be joined are bombarded by a stream of high-energy electrons in a vacuum. By concentrating the beam on a small area, sufficient heat is generated to fuse the edges of the workpiece and permit welding. In all cases, electrons are generated by heating a filament, usually tungsten. The equipment varies in regard to power and beam focus. In electrostatic focusing, the electrons are emitted through a small hole in a plate. Due to the electrical lines of force present about the hole, the stream of electrons is focused into a narrow beam. The electromagnetic focusing system employs a series of magnetic lenses to concentrate the beam in a manner similar to that of an electron microscope. Although electrostatic focusing is simpler, electromagnetic focusing results in a narrower beam and a higher concentration of energy.

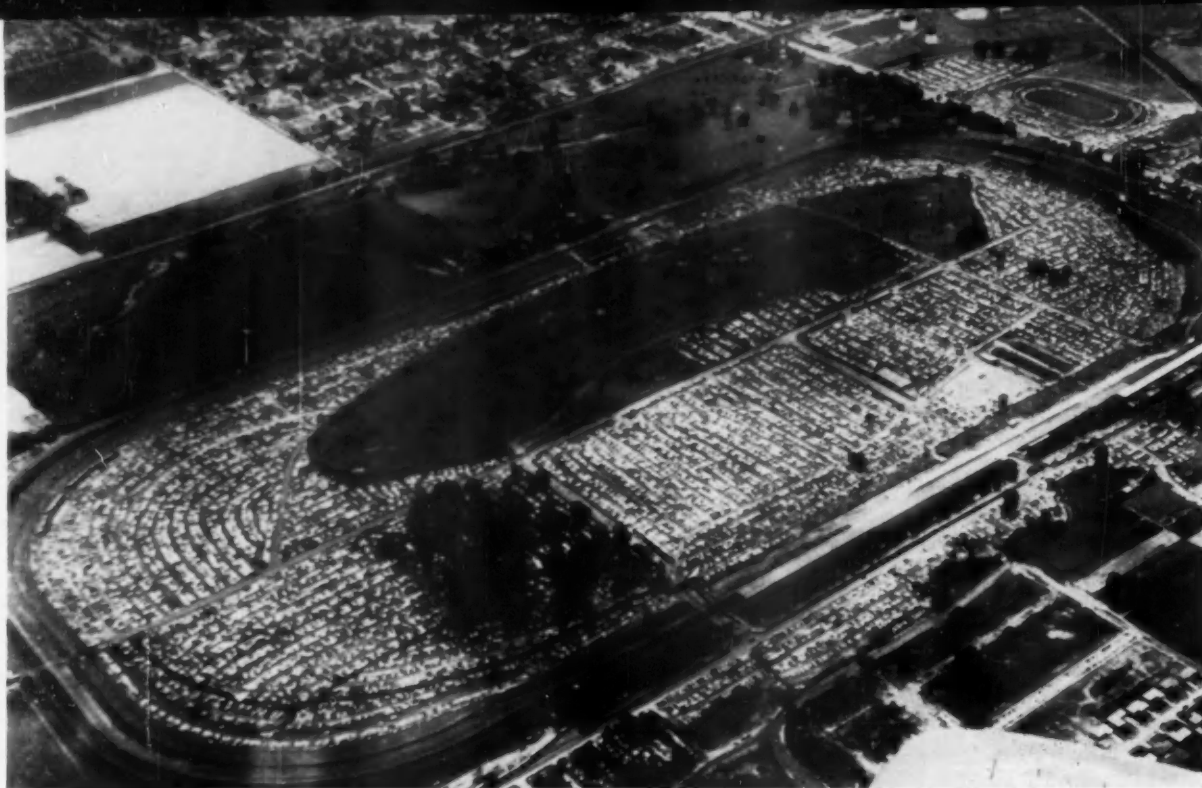
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Applications and Limitations of New Developments in Metals Joining Processes

By P. J. Rieppel
Battelle Memorial Institute

THE metals-joining field has undergone many changes in the past few years with the introduction of new welding processes and the modification of existing tech-

niques. In order to avoid the tendency of considering new processes as a ready-made solution for old and recurrent problems, it is necessary to know how the process



This aerial view shows the full extent of the 2 1/2 mile track and the parking problem that is so capably handled. The open area in the center is a nine hole golf course, while the wooded section is set aside for picnickers.

SAFE DRIVING at 170 MPH?

WHAT safety is there in driving a car at 170 miles an hour?

On the highway it's suicide. Road, car, driver, and operating conditions are just not prepared for speeds like that.

Even at the Indianapolis Motor Speedway safety can't be guaranteed, but thousands of dollars and hundreds of people are working to provide at least a margin of safety in the world's greatest automobile spectacle.

It may not be easy to spot, but when the big cars swing out of the pits May 30 a combination of safety factors will be working for every driver. Let's take the four contributors—road, car, driver, and conditions—and see how they apply here.

First, the road . . . the track itself. When it opened in 1909 (two years before the first 500-mile race) the track was macadamized dirt, but the following year the entire running surface was

Here's How Drivers, Spectators and Cars are Protected at Indianapolis...

By Joseph L. Quinn, Jr.
Safety Director

INDIANAPOLIS MOTOR SPEEDWAY

covered with brick, giving the Speedway its affectionate name of "The Brickyard." A two-inch layer of asphalt was applied over the brick in 1936, and it now covers all but a section of the main straightaway. This stretch remains today only for sentimental reasons. It reminds the old-timers of the

"Brickyard" days, and being a straightaway it is not considered hazardous.

Until the mid-1930's the infield and pit area were separated from the track by a concrete inner wall. Right on the edge of the running surface, this wall was a constant hazard. When the wall was finally removed it was replaced by a 20 to 50 foot wide safety apron of concrete that is traditionally reserved for cars in trouble.

The outside wall around the track also was once a magnet for

careening cars. It was originally built perpendicular to the ground, but this was not a sharp enough angle at the turns, and a number of damaged cars went over. The wall has now been rebuilt to run perpendicular to the angle of the track.

In 1958's tragic first-lap mishap a peculiar combination of circumstances sent Jerry Unser's car over the wall, but this is most unusual. Should a car hit the wall today, it would ordinarily be a glancing blow, and the car would stay on the track.

Another old danger spot that has since been taken care of is the pit area. Once a sharp turn into a narrow alley, this section now boasts a wide driveway set at an easy angle to the safety apron.

This 40-ft wide strip is actually a two-lane road, with the outside lane for entry and exit and the inside reserved for car repairs. Pit crews are separated from the road by a two-foot concrete wall, low enough for crewmen to get over quickly, yet high enough to deter a skidding car.

Second, the cars. There is speed in every line, but there is safety, too. Roll bars are now standard on all cars, and switches automatically cut off the engine to prevent an explosion in case of accident.

Each car is examined with great care before it is allowed on the track. The Technical Committee of the United States Auto Club (USAC—the sanctioning organization) scrutinizes every detail of construction, both for the safety of the driver and his fellow competitors.

One recent improvement in "500" safety is the metal inspection machinery employed in this check-out period. There are two processes—Magnaglo for ferrous (iron base) metals and Zyglo for the non-ferrous, such as aluminum and magnesium.

Although only the wheels and steering mechanisms are required to undergo this inspection, most cars get a thorough going over to check for flaws or cracks in the metal. The constant pounding of wheels on track can make a dangerous break out of a hairline imperfection.

Another great contribution has been the development of a reliable racing tire, the result of many years of testing in the laboratory and under race conditions right here at the Speedway. These special tires are sold—not given—to the car owners or drivers. It is not unusual for a car to use up 12 tires in the heat and speed of a 500-mile duel.

Third, the drivers. Before qualification begins on May 16 each driver must pass a thorough physical examination. Particular attention is paid to his eyes, which need excellent depth perception and color sensitivity to judge distances and road signals on the warning network.

His safety equipment will include crash helmet, goggles, and fire-resistant coveralls, and once he enters the car he is secured to the seat with a safety belt.

The driver's skills also are analyzed. Even the veteran drivers must retain a satisfactory performance standard, for violations of good driving practice are apt to result in suspension.

Rookie drivers—those new to Indianapolis—must pass a driving test under the watchful eyes of USAC observers and a committee of veteran drivers. The test is 10

laps each at 115, 120, 125, and 130 mph over the Speedway course.

Nine observer posts are maintained at strategic positions around the oval, with two USAC men in each post. At the first hint of trouble, the specific information is relayed to the other posts and immediately to the other cars on the track by use of yellow flags and lights. When this color is shown each driver is required to maintain his present position (no passing) and drive with extreme caution.

Only after the cars and drivers have both passed these tests are they permitted to take part in the qualifying runs. The same precautions and rules that hold on Memorial Day are observed every time a car is on the track.

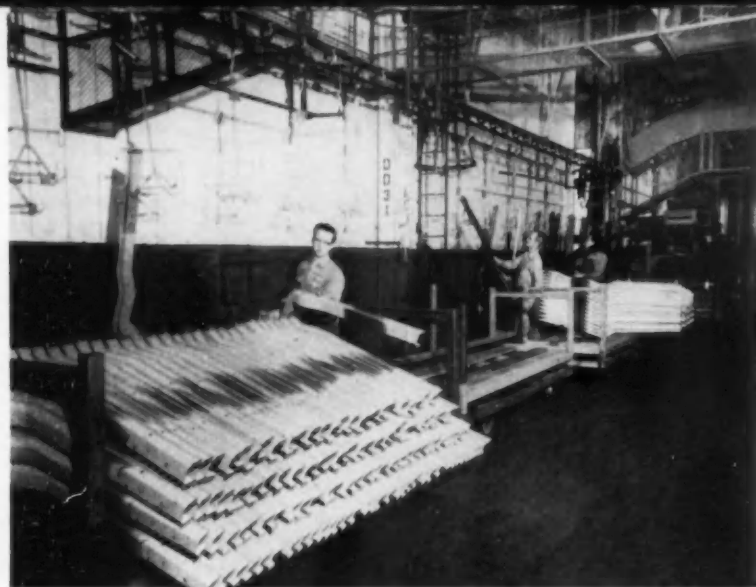
Finally, the driving conditions. The highway driver knows the problems of overcrowding, and we run into the same problem. The Speedway track ranges from 50 to 60 ft in width, the latter at the turns.

With 33 cars traveling at top speed there's not much comfort in running more than three abreast at any point on the track. Of course, the professional driver isn't used to comfort.

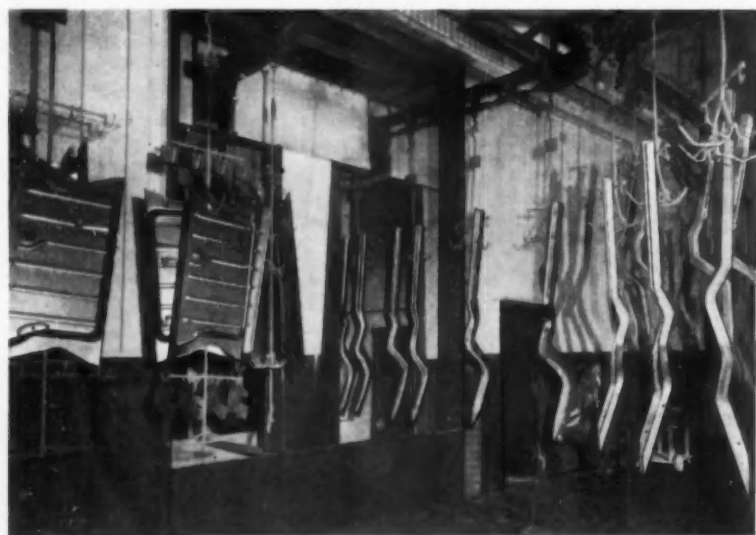
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Six CO₂ extinguisher horns may be seen aiming at a car in the "500" after a gasoline overflow hit the hot exhaust pipe and burst into flame. Fyr-Fyter provides both the extinguishers and the pit safety teams as a public service.



Conveyor junction in the zinc paint department. The operator in the foreground is in the act of hanging sheet metal stampings on the conveyor en route to the paint shop. The operator in the background is seen removing finish painted parts on the return trip of the same conveyor. These parts, in turn, are loaded onto the trucks which previously had brought in the raw parts.



CORVAIR

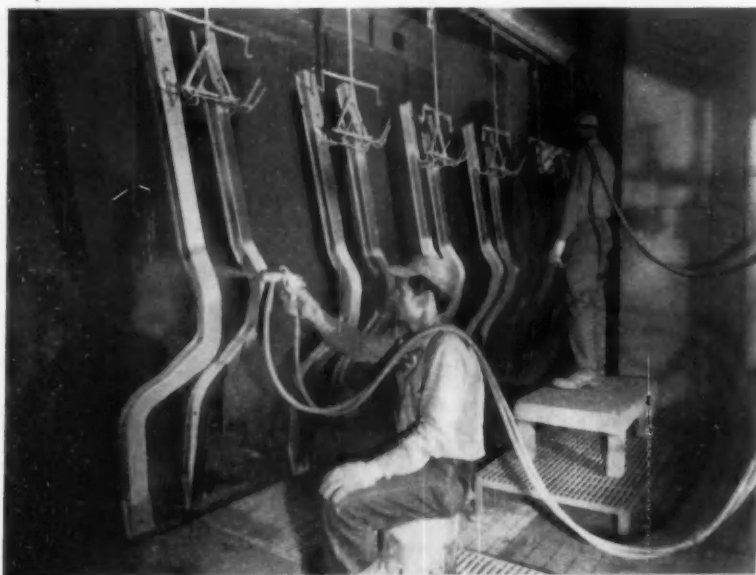
WITH the introduction of unitized bodies this year there was agreement by all concerned that special rust-preventive measures had to be taken for the protection of the interior of boxed sections as well as other areas of the underbody structure that are inaccessible to normal paint spray procedures. Each of the major producers then initiated its own solution to this problem.

At the present writing there are three principal ways of handling underbody rust proofing: immersion in some form of paint, usually of water-soluble type; use of galvanized steel stampings; or coating with a zinc-rich paint. The latter is the process selected for underbody protection on the Corvair body and is the process to be described in this article.

Zinc-rich paint, formulated with approximately 92 per cent of zinc dust by weight in a specific vehicle, has been adopted by Fisher Body for the corrosion-resistant coating and is being applied on some 100 parts for the Chevrolet Corvair body. About 92 of these parts go into the underbody section produced at the Grand Blanc plant of Fisher Body, the subject of this report. Among the stampings and sub-assemblies given the treatment, to be described here, are: rear quarter panels, floor pans, center pillars, integral frame parts, front and rear compartment panels, and a variety of smaller stampings.

Close-up in the water-back paint spray booth where the parts are coated with the special zinc-rich paint. There are two booths of this kind, one for each of the two feeder conveyor lines.

View of the two parallel overhead conveyor lines which transport the parts through the iron-phosphate unit. Note that each conveyor is equipped with hooks suitable for the different kinds of parts.



Underbody Rustproofed ... WITH ZINC-RICH PAINT

In view of the large volume of production associated with the Corvair, as well as the variety of shapes and sizes of individual parts, it became necessary to develop a compact, integrated and fully mechanized paint finishing system. Initially, this posed some problems considering that painting has not been associated with a large sheet metal fabrication plant up to now. Eventually, the details of this system were developed cooperatively between the master mechanic's department at Grand Blanc and the paint specialists at the central office of Fisher Body.

As will be obvious from the illustrations, the key to mechanization is a system of two separate monorail conveyor lines, each one fitted with hooks for handling certain kinds of stampings. One of the interesting points, as illustrated, shows the junction of the conveyor loop marking the start and finish of the entire operation. On one side, the operator hangs the individual stampings on the conveyor for processing; on the other side, an operator may be seen in the act of removing painted parts. These stations are in such close proximity that the trucks from which the raw stampings were unloaded can be pushed a matter of just a few feet for use immediately for re-loading with painted stampings.

The stampings on the two parallel conveyor lines move together for transport through a large unit where they are chemically washed and sprayed with an iron-phosphate solution. The function of this coating is to provide a passive protective coating over the steel, serving at the same time as an excellent base for securely adhering the zinc-rich paint which is applied later.

As the parts leave the dry-off oven, they enter one of two water-wash spray booths. Here the op-

erators spray the parts either all over or on one side only, as instructed. The point is that only sheet metal areas which cannot be reached by paint spray guns, when the body assembly is finished, require the protective coating. Unlike other kinds of finishes, the zinc-rich paint is air-drying and requires only a few minutes of exposure to dry thoroughly. The required time cycle of some seven minutes is provided by the exposed length of the conveyor between the spray booths and the unloading station.

The zinc-rich paint, supplied by several sources, is also known as a weld-through primer since it must have excellent welding quality, comparable with bare metal. From a technical standpoint the coating must combine long-lasting protection against corrosion. Fortunately these properties are inherent in a paint of the proper composition. For example, it has been found that for best protection the paint should have approximately 92 per cent of zinc dust by weight of dried film in a suitable vehicle. The lowest acceptable value of the concentration is around 90 per cent.

By the same token, welding quality is at the maximum between these values. As concentration decreases, welding quality deteriorates. If the concentration of zinc is much below 85 per cent, electrical resistance of the coating in-

creases and the weld either does not penetrate at all or is of poor quality.

This then provides a simple test for welding quality of a batch of paint. To this end, they have a small welding machine outside the department for quality control. A sample is taken from a container in a new batch and is used for coating a welding sample. If the resulting weld is good, it is assumed that the batch of paint comes within the specified limits of concentration. If the weld is poor the entire batch is set aside and each barrel is tested individually for acceptance or rejection.

As one may imagine, this paint material is extremely heavy by comparison with ordinary body primers or color paint. In fact, a 30-gallon container weighs some 600 lb. This poses an uncommon problem of handling when the container is tumbled and each container must be thoroughly tumbled to assure proper distribution of metallic zinc dust in the vehicle.

Fisher Body practice is to produce a coating approximately two-mils (.002 in.) in thickness. This is considered to be thicker than the average coating of a galvanized sheet and is probably more uniform in thickness over the material. Judging by the experimental data supplied by the American Zinc Institute, the two-mil coating should provide adequate protection in an industrial atmosphere for the life of the car.

Moreover, this coating provides the same mechanism of galvanic action in the presence of water as does the electro-deposited zinc coating. It is also self-healing in the same way in the event that bare metal becomes uncovered. ■

Air Conditioner Sales Expected to Double

Air conditioning installations on Chryslers are expected to more than double in the next three years, according to E. M. Braden, general sales manager for Chrysler and Imperial Div. He says that air conditioner sales have jumped from 8.7 per cent in 1957 to 16.7 per cent at the end of January.

California's Gov. Edmund G. Brown signed into law a bill which makes it mandatory to install an anti-smog device on new motor vehicles within a year after two such devices are approved.

Used commercial vehicles must have one in the second year. And by the third year, it'll be compulsory on all motor vehicles.

By Joseph Geschelin
DETROIT EDITOR

Efficient Antismog Device Developed by Thompson Ramo Wooldridge

SMOG is a problem that has plagued the Los Angeles basin for a long time. As discussed in an earlier article in *AUTOMOTIVE INDUSTRIES* (see AI, July 15, 1954) the basic problem is climatic. However, the automotive industry, through the Automobile Manufacturers Association, is committed to find some practical accessory that will reduce exhaust emissions to an acceptable value.

The Air Pollution Control Agencies of California have established some maximum numbers for the value of motor vehicle exhaust emissions that are considered tolerable. These numbers as required by the State of California are as follows: $1\frac{1}{2}$ per cent CO (carbon monoxide); 275 parts per million hydrocarbons (hexane equivalent).

The automobile manufacturers in a cooperative research and engineering program, along with several independent organizations have been working on catalytic type mufflers. A number of companies also have been working with direct-flame type afterburners.

This article is concerned with the development of a commercially

feasible afterburner conceived by the Staff Automotive Development Laboratories of Thompson Ramo Wooldridge Inc., (TRW) and based on preliminary investigations con-

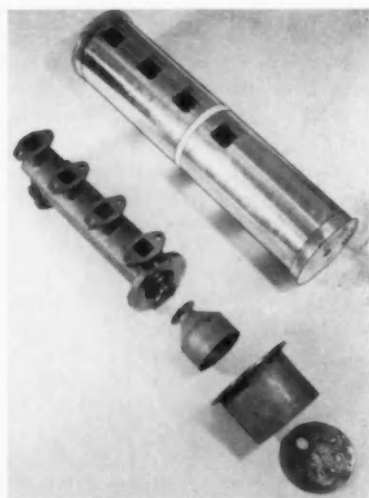


Fig. 2—Exploded view of TRW afterburner, showing the exhaust manifold, combustion chamber, and end cover. Above these is the stainless steel enclosure with its blanket of insulating material.

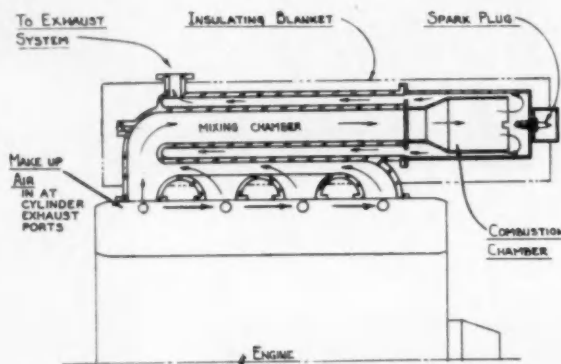


Fig. 1—Schematic drawing of TRW exhaust manifold afterburner. Exhaust gases, together with metered make-up air, enter the mixing chamber and sweep into the combustion chamber at the extreme right. Burned gases at elevated temperature leave the combustion chamber through a series of tubes surrounding the mixing chamber.

ducted by the Ramo Wooldridge Division of TRW. This project, under way for some time, has been conducted co-operatively with the Chrysler Corp. and is part of an industry program of research and development. Dynamometer work in the Cleveland Laboratories has been conducted with Plymouth V-8 engines. Adaptation to a conventional passenger car and testing on the road has been conducted by Chrysler.

All of the work so far has been done with prototype equipment. From now on the effort will be directed at refinements and simplification in the interest of space and cost economy.

The basic design principle embodied in the TRW afterburner is shown in the schematic sketch, Fig. 1. Backbone of the device is a casting replacing the normal exhaust manifold. The exhaust mixture enters the manifold through the ports and is directed to the mixing chamber. At the same time, make-up air is introduced to the mixture to render it more combustible.

The exhaust mixture then enters



Fig. 3—Close-up of modified Beckman gas analyzer, embodying modifications developed by TRW.

the combustion chamber at the right where it is burned. The products of this combustion leave the combustion chamber through a series of tubes arranged about the mixing chamber and discharge through the exhaust system.

Major components of the afterburner may be seen in the exploded view, Fig. 2. The complete assembly, a long cylinder, includes a heavy padding of insulating material enclosed in a stainless steel covering.

Two afterburners are required on a V-8; one on a four- or six-cylinder engine. In the prototypes, the exhaust manifold is a casting of a modified ductile stainless steel. The remaining components, including the tubing and combustion chamber, are fabricated from a TRW specification stainless steel, stemming from a new valve steel analysis.

This afterburner requires certain additional accessories to make the installation work. First is an air pump for supplying low pressure air in adequate volume for admixture with the exhaust gas. The pump is arranged to provide

the flow of air equally to each side on a V-8 engine.

The second accessory is a self-contained ignition system, independent of the engine ignition system.

This supplies current for firing the single stainless steel spark plug in the afterburner combustion chamber. The ignition system is required to initiate combustion

AFTERBURNER EFFECTIVENESS								
CONDITION	BASIC ENGINE EMISSIONS				AFTERBURNER EMISSIONS			
	Hydrocarbons		Carbon Monoxide		Hydrocarbons		Carbon Monoxide	
	Meter	PPM	Meter	%	Meter	PPM	Meter	%
CITY TRAFFIC OPERATION								
Average.....	26.8	588	48.0	4.80	1.3	25	6.5	.55
SIMULATED TRAFFIC CYCLE (CHASSIS DYNAMOMETER)								
Idle.....	24	524	75.5	9.25	1.3	25	1.7	.15
0-50 Accel.....	17	375	33	3.1	1.3	25	1.7	.15
50 MPH Cruise.....	9	194	17	1.4	1.1	21	2.5	.20
50-20 Decel.....	82.5	2064	60.5	6.5	1.1	21	2.5	.20
20 MPH Cruise.....	31	680	28.5	2.6	1.1	21	1.7	.15
20-30 Accel.....	21.5	470	25	2.25	1.1	21	1.7	.15
30 MPH Cruise.....	17.6	384	28.5	2.6	1.3	25	1.7	.15
30-0 Decel.....	18.5	405	66.5	7.56	.9	17	1.7	.15
Idle.....	23	503	76	9.4	1.1	21	1.0	.10
0-30 Accel.....	20.5	444	36	3.4	.9	17	1.7	.15
30 MPH Cruise.....	15.5	335	24.5	2.2	.5	10	1.7	.15
30-15 Decel.....	25	550	70	8.15	.5	10	3.5	.30
15 MPH Cruise.....	22	485	60	6.4	.8	15	3.0	.25
15-40 Accel.....	16.8	365	28.5	2.6	1.1	21	1.0	.10
40 MPH Cruise.....	12.5	272	23.5	2.1	1.2	23	3.5	.30
40-0 Decel.....	48.5	1084	71.0	8.4	1.4	27	3.5	.30
Idle.....	28.7	630	76	9.4	.9	17	1.0	.10
Average.....	30	655	57	6.0	1.1	21	2.5	.20
SHORTED PLUG (DYNAMOMETER ENGINE)								
Average.....	53.5	1204	72.5	8.7	3	62	9.5	.8

NOTE

- 1 Meter readings are from Latham-Berthel Model 15 Non-Dispersive Infrared Analyzer and are Micropercent.
- 2 Concentration of hydrocarbons are given in ppm Hexane equivalent.
- 3 Concentration of carbon monoxide is given in percent by volume.
- 4 Arithmetic average of ninety-seven individual points of data for the complete simulated traffic cycle. Data points taken approximately every four seconds.

Table 1. Chart prepared for this study by TRW to indicate the effectiveness of the afterburner installation.

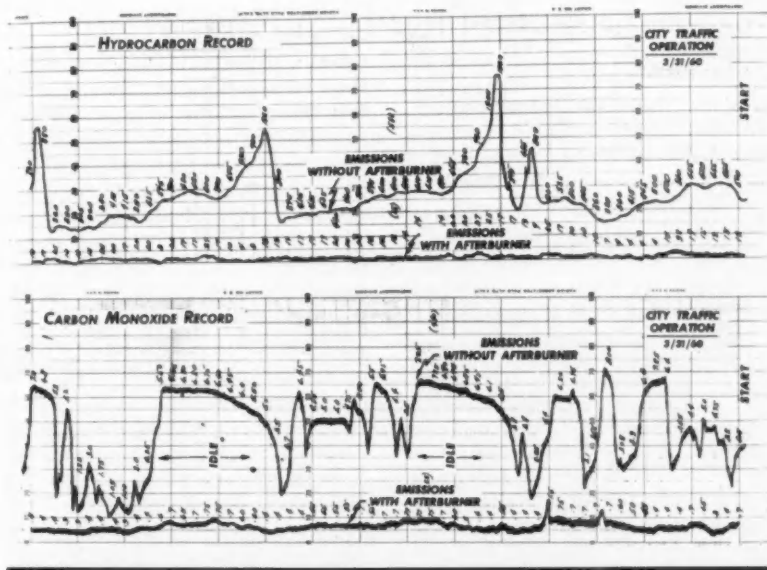


Fig. 4—Small segment of charts stemming from vehicle operation in city traffic. The vehicle was equipped with a V-8 engine, with afterburner on one side, normal manifold on the other.

for starting when the engine is cold.

Reverting to Fig. 1, consider the principle of operation more in detail. The afterburner serves a regenerative function in a unique manner. It goes about like this: the temperature of exhaust gases at the manifold varies from 700-1600 F. At the combustion chamber of the afterburner, the temperature is in the range of 1400-1700 F. The reverse flow of hot gas from the burner to the exhaust manifold sweeps over the mixing chamber at the higher temperature, thus increasing the temperature of the cooler incoming stream of exhaust gas. The effect of this heat exchange is to raise the temperature of incoming gases, thus promoting better and more complete combustion.

A great deal of dynamometer testing, using a modified Beckman gas analyzer, Fig. 3, shows that the TRW afterburner yields the following reproducible results: 0.5 per cent carbon monoxide; 50 ppm hydrocarbons, (hexane equivalent); 14.5 per cent carbon dioxide (minimum).

It will be noted that these numbers are considerably lower than required values.

To obtain comparable test data both on the dynamometer and in the experimental vehicle installations, V-8 engines are tested with an afterburner in operation on one side, and a non-operating unit on the other side. Plumbing is so arranged that gas can be drawn from one side or the other for analysis. It is important to note that the gas analysis given immediately above is maintained without much change regardless of engine condition, even when one plug is shorted out.

One of the questions that naturally arises is this: just what penalty must be paid for an afterburners installation? According to Chrysler Engineering, there is a loss of power at the extreme peak of the power curve, but there is no significant performance loss in the usual operating range.

As mentioned earlier, testing has been done from every available direction: dynamometer, chassis dy-

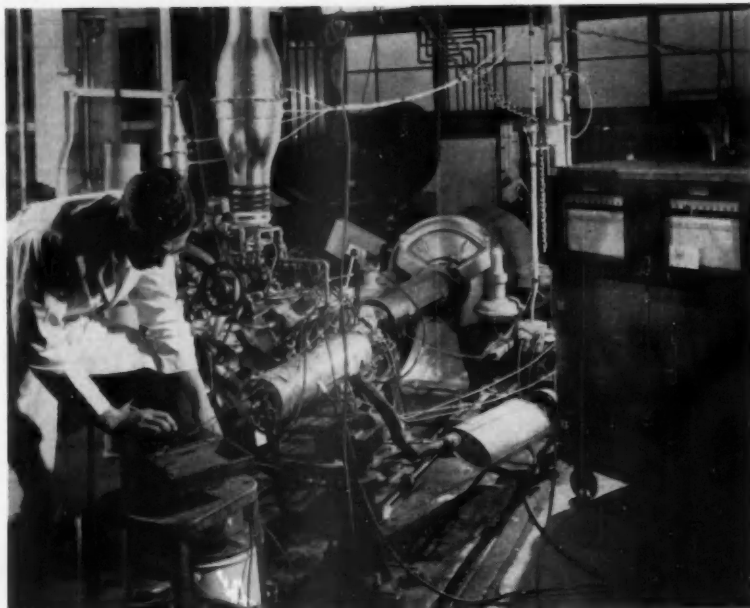


Fig. 5—Close-up of prototype testing on one of the dynamometers in the Staff Automotive Development Laboratories in Cleveland. The prototype afterburner is seen in the foreground, mounted on a Plymouth V-8. The opposite side has the conventional exhaust manifold. Both deliver exhaust gas into the single muffler at the right.

namometer, road testing. Road testing, naturally, is the payoff since it provides an accurate picture of the behavior of the exhaust system under actual city driving conditions. On the other hand, Chrysler and TRW engineers say that simulated road test schedules on the chassis dynamometer correlate well with road test results.

The charts in Fig. 4 show a comparison of emissions for road operation with and without an afterburner on a car, with emissions approximately equal to those assumed for the average car in developing the California standards. It should be mentioned that these charts represent only a small sample of the results. The record of hydrocarbon emissions is taken in the same vehicle, reading values for each manifold side, i.e., an operating afterburner on one side, and a non-operating unit on the other. It will be seen that with the non-operating unit, values range from a low of 305 ppm to peaks of 880, 1220, and 1820 ppm.

With the operating afterburner the values for hydrocarbon emissions range from lows of 3-ppm to maximum values of 25 and 37 ppm. The contrast becomes quite striking when presented in this fashion.

The carbon monoxide record on

the same run is even more striking. The notable characteristic on both records is that the non-operating side is subject to rather violent variations in emissions, depending upon operating conditions. The operating afterburner side, on the other hand, maintains a relatively steady state of emissions without large variations in numbers.

The whole picture is best appreciated from the figures in Table 1, summarizing the results of a variety of tests. For city traffic operations we have the averages of values for the entire run. The simulated traffic run on the chassis dynamometer is given in a more detail, with averages also shown for comparison. The last line of numbers provides the picture of what happens when a plug is shorted deliberately.

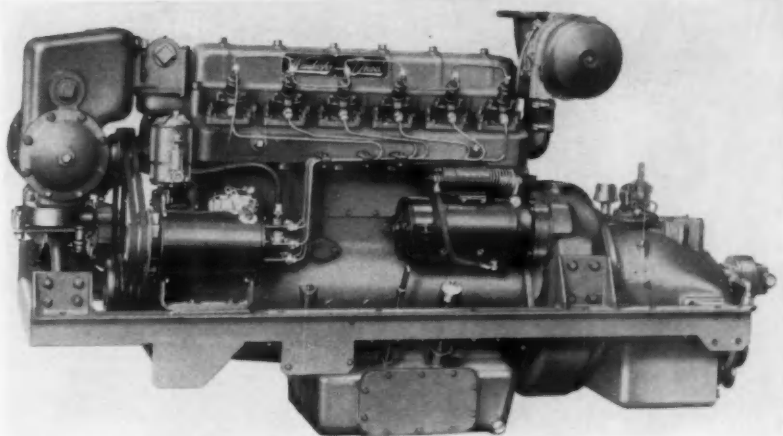
Bear in mind that all of the mechanism described here is of prototype origin. Chrysler and TRW engineers believe that many refinements are feasible before the design is frozen for production. For one thing, it may be possible to reduce the size of the unit, perhaps make use of less expensive materials.

There are certain sidelights of technical interest to this picture.

(Turn to page 80, please)

Waukesha's Newest Marine Diesel

The Waukesha Model 197-DLC "Navigator" marine Diesel has a total piston displacement of 302 cu in. and when turbocharged has a continuous-duty rating of 85 hp at 2000 rpm



By Charles A. Weinert

EASTERN EDITOR

THE Model 197-DLC "Navigator" is the newest addition to the marine Diesel engine line of Waukesha Motor Co. Designed for the smaller work-boat market, this 302-cu-in. engine, is rated 85 hp at 2000 rpm for continuous 24-hour duty, when equipped with an AiResearch turbocharger. When normally-aspirated, it is rated 65 hp at 2000 rpm for continuous 24-hour duty.

The Navigator is a six-cylinder four-stroke ohv engine with a bore and stroke of 4 by 4 in. Its seven-bearing crankshaft of drop-forged steel has hardened main journals and crankpins of 2 1/2 in. diam. Connecting rods, also of drop-forged steel, are rifle-drilled for pressure-lubrication of piston pins.

Cylinder sleeves are of the dry type. Pistons are cam-ground aluminum, fitted with five rings, and are oil-cooled. Piston pins are full-floating type.

Combustion chamber design is of the type generally used in the Waukesha line of Diesels. For each cylinder it consists essentially of a spherical combustion chamber—made up of a two-piece insert installed in the cylinder head from the outside of the engine—having

a tangential throat outlet leading to two swirl cups in the piston crown. The fuel-injection system employs a Roosa Master gear-driven injection pump connected by drawn steel lines to single-orifice pintle-type nozzles. Primary fuel pump is Roosa with hand primer. Air cleaners are of the dry type.

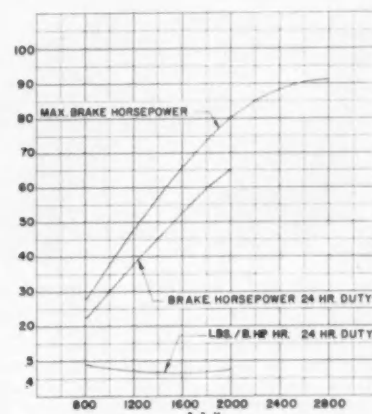
Lubrication system is full-pressure type, with a positive gear-type pump forcing oil through drilled passages to each main, camshaft and connecting rod bearing, piston pin, piston crown, rocker arm, and to idler gear stud and gears.

Cooling circulation through the engine is handled by a belt-driven centrifugal water pump and bypass, flange-mounted at the front of the cylinder block. The raw water pump is gear-driven off the gear train. Water jacket heat exchanger, as well as lube oil cooler, are integrally cast into the cooling system expansion tank. The exhaust manifold is of course watercooled.

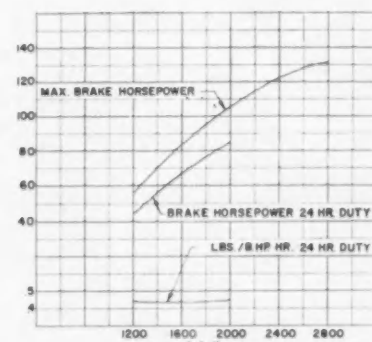
The Navigator has an overall length with gear of 67 in. and a height of 32 in. Its weight is approximately 1550 lb.

Six additional Diesel engine models are being offered by Waukesha for marine service—in both normally-aspirated and turbocharged versions. Total piston displacements are 426, 779, 1197, 1905, 2894, and 5788 cu in. Continuous-duty ratings of these engines range from 100 hp at 2000 rpm, normally-aspirated — to 990 hp at 1215 rpm,

turbocharged. The largest one is a V-12, while all of the other models are six-in-line type.



Performance of 197-DLCM normally-aspirated engine



Performance of 197-DLCSM turbo-charged engine

Patterns and Dies of Nickel

Made by New Process

AUTOMOTIVE patterns, molds and dies of nickel are now being made by a unique fast-moving process just unveiled. It reproduces complex and

compound-contoured shapes to close tolerances without machining—and gives tough surfaces for long wear-life in high-production operations.

Called the Budd Carbonyl Metal Process, this entirely different and exclusive approach to the manufacture of foundry items and forming dies was developed after more than four years of research. Actual production of patterns for users began last August. Customers include divisions of General Motors Corp. and Ford Motor Co., as well as American Motors Corp., International Harvester Co., and a number of the automotive suppliers.

Carbonyl Metal Products—a division of The Budd Co.—located at 904 Ridge Pike, Conshohocken, Pa., developed the process and is the sole maker of patterns, molds and dies produced by this method.

The process—of the gas deposition type—is quite interesting in itself. Processing material is nickel carbonyl, composed of nickel and carbon monoxide. In essence, the nickel from the nickel carbonyl is deposited on a form to produce a shell of pure nickel—usually about $\frac{1}{8}$ in. thick—for the facing of a pattern or die. Steps in the process are shown in Fig. 1.

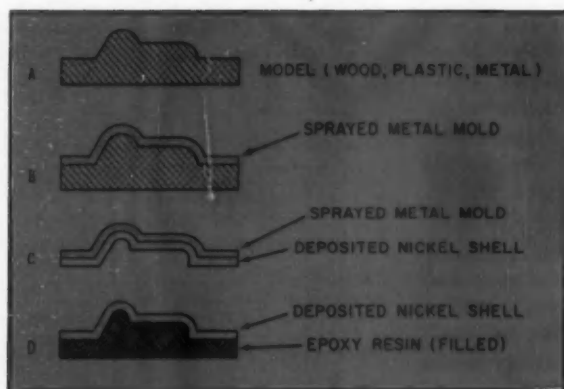
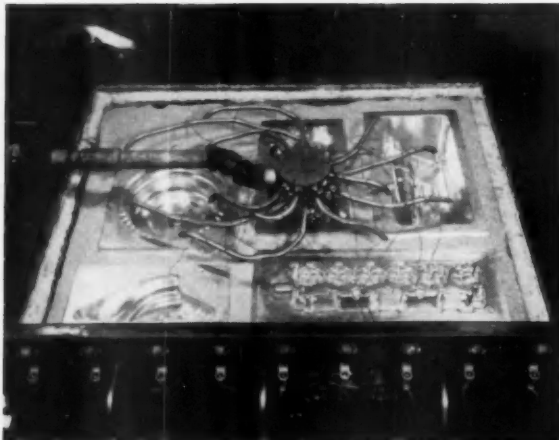


Fig. 1—Major steps followed in making carbonyl nickel shells for patterns, molds and dies. Master model (A) is hot-sprayed with eutectic to form a metal mold (B). Metal mold is placed in depositing chamber where nickel from the decomposition of nickel carbonyl is deposited (C) on impression surface of metal mold. The nickel shell is then backed up with metal-filled epoxy resin (D).

From the master cylinder-head pattern at left, the eutectic mold at right was obtained by metal-spraying. Metal mold is being checked prior to placing in nickel carbonyl depositing chamber.



Depositing chamber with eutectic molds, thermocouples, and manifold in place, ready for sealing prior to entry of nickel carbonyl gas. When chamber is sealed, nickel carbonyl gas flows through the manifold openings and decomposes to form pure nickel on the heated molds.



By
Charles A. Weinert
EASTERN EDITOR

Nickel patterns and molds for various automotive applications, produced by the Budd Carbonyl Metal Process.



The Process

This starts with a master of wood, plastic or metal as received from the customer.

After treating the master with a release agent, it is hot-sprayed with a eutectic compound (tin alloy) to form a mold about $\frac{1}{2}$ in. thick.

The eutectic mold is removed from the master, and inspected for exact duplication and tolerances. It is then placed, with its impression surface facing up, in a special depositing chamber.

Before the deposition process starts, the depositing chamber is sealed, carbon dioxide is introduced into the system, and the eutectic mold heated to between 325 and 340 F.

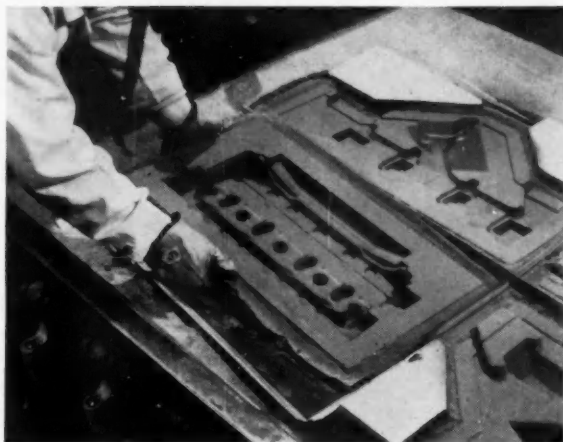
Liquid nickel carbonyl is fed into a vaporizer (Fig.

2) by the pressure of CO_2 which serves as a "pump." The vaporizer, heated to 180 F by hot water, converts the liquid nickel carbonyl into a gas that forces its way to the depositing chamber.

When nickel carbonyl vapor is heated above 280 F, it breaks down into free nickel and CO. Therefore, since the eutectic mold has been preheated to between 325 and 340 F, deposition of nickel on the mold now takes place.

The nickel is deposited molecularly, and thickness of the deposition depends solely on time. Generally the deposition cycle takes from 24 to 38 hours for runs of 0.121 to 0.225 in. thickness. The thickness may range from 0.050 to 0.400 in.—or, from a very thin coating to literally whatever may be desired. (*cont'd*)

Removal of completed carbonyl nickel shell from depositing chamber. This view shows under side of the nickel shell.



Final inspection of nickel cylinder head pattern (left) against master, after removal from depositing chamber. The nickel shell is usually backed up on the under side with epoxy resin containing metal filings and a steel plate having mounting holes.



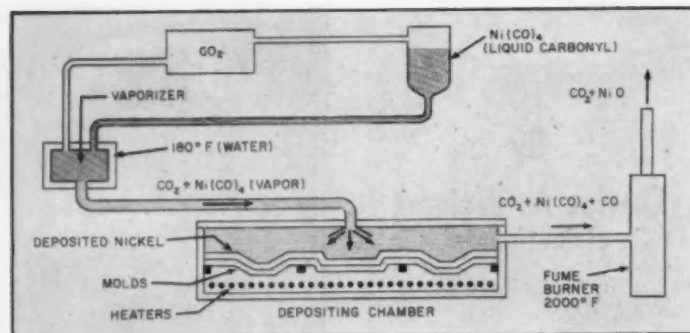


Fig. 2—Flow diagram of Budd Nickel Carbonyl Process. CO, "pumps" nickel carbonyl liquid into heated vaporizer. Nickel carbonyl, now a gas, flows into depositing chamber. In depositing chamber, the nickel carbonyl gas decomposes and deposits pure nickel on the heated molds. Nickel deposition is in proportion to length of time. Residue of decomposition is oxidized by burning before being exhausted to atmosphere.

Carbonyl nickel shell being fitted to gray iron casting to produce forming die for automobile headlamp opening or "eyebrow." The shell is mounted on the casting with a backing of metal-filled epoxy resin.

nickel produced by the decomposition of nickel carbonyl gas.

APPLICATIONS

Thus far, applications of the process have been centered mostly on automotive forming dies, blank holders, and foundry items such as patterns, core boxes, die cast inserts, permanent molds, and shell molds. Typical products being made with carbonyl nickel patterns and molds are fuel pump bodies, torque converter and transmission housings, bell housings, differential housings, cylinder heads, exhaust manifolds, brake drums, and carburetor parts.

The process also is applicable—and in a number of cases has already been applied—to the making of various types of molds, jigs, fixtures, and other tool shapes for use in the rubber, plastics and glass industries, as well as in the metal-working field. Aluminum automotive casting applications are good potentials—aluminum doesn't adhere to the nickel.

Depending upon the requirements of the individual end use, carbonyl nickel is not generally suggested by the company for use in complicated die-casting dies, nor in dies for shearing, blanking, cutting, and extrusion of metal.

PROPERTIES

Hardness range of the carbonyl nickel is 181 to 222 Brinell. It has
(Turn to page 78, please)

When the mold has received the desired thickness of nickel for the intended application, the nickel carbonyl input is shut off. The chamber is purged with CO₂, opened, and the mold removed.

The mold is then parted from the nickel shell and discarded. Sometimes the nickel shell is shipped as is to the customer. In other cases, it is backed up with a mixture of epoxy resin containing aluminum or iron filings, together with a steel backing plate, for added strength and to provide holes for mounting or lifting bolts. At this stage, the process has produced the end product.

During the processing cycle, the released CO creates a pressure within the depositing chamber which forces the gases through exhaust lines to a burner operating at about 2000 F. This burner ignites the exhausted gaseous nickel carbonyl and CO, converting them to nickel oxide and CO₂ respectively.

Several molds can, of course, be placed in the depositing chamber for processing at the same time, providing the same deposition treatment is applicable to all. The process must be a continuing or

constant one, and cannot be interrupted.

This processing method will also produce an opposite of the master supplied by the customer. In such cases a negative of the master is made of epoxy resin, which is spray-coated with the eutectic to form a positive mold—then coated by deposition to end up as a negative of the original.

NICKEL CARBONYL

"Carbonyl" is not a trade name, but rather a chemical term signifying either the bivalent radical CO, or a compound of this radical with a metal such as in *nickel carbonyl*, Ni(CO)₄. The latter, used in the process, comes in pressurized tanks in liquid form. It has a boiling point of 111 F. Both in appearance and in its highly-volatile characteristics, it resembles ether.

Nickel carbonyl is extremely toxic. Maximum safe limits in the atmosphere are one part per billion, necessitating the use of constant monitoring with detection equipment. This toxicity is limited, however, to the process only, and in no way applies to the final product.

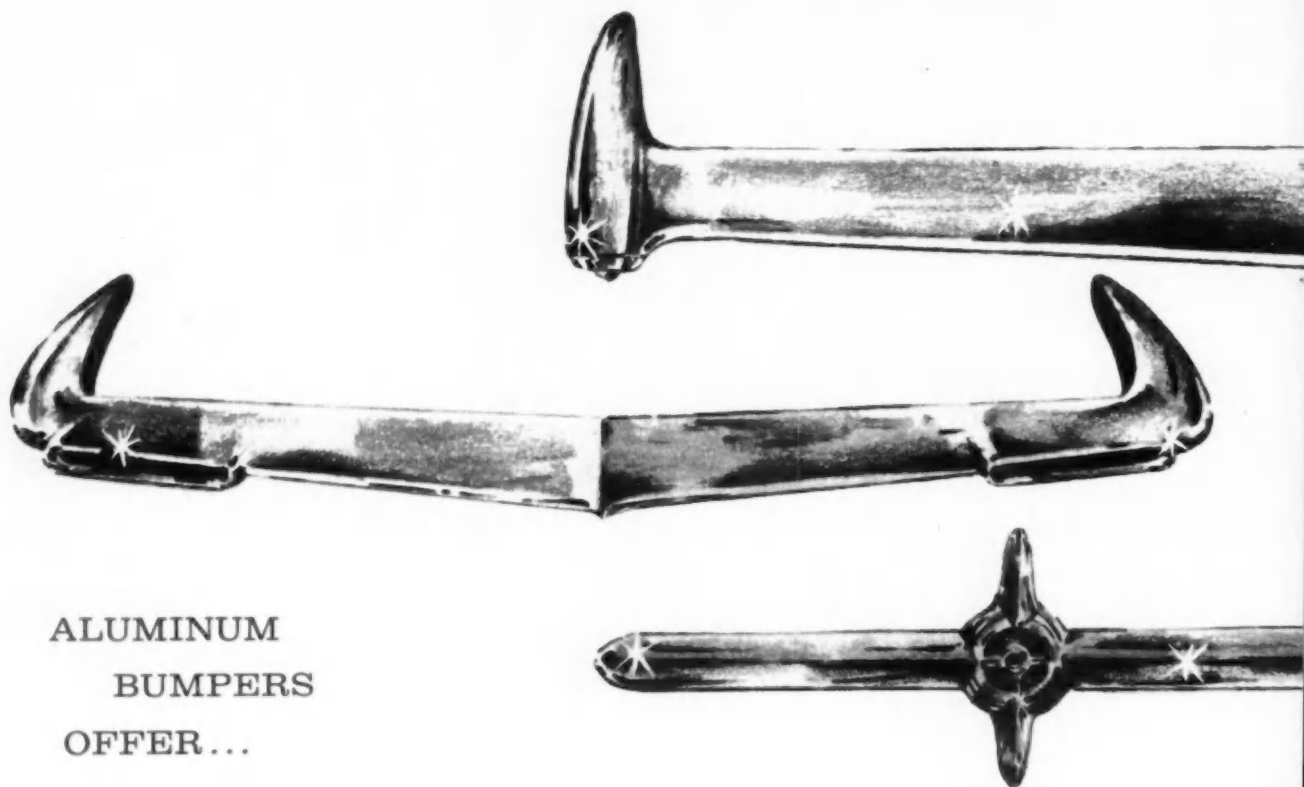
The reverse terminology, *carbonyl nickel*, is the name given the



How Aluminum Bumpers



reduce costs,
cut weight,
permit design
versatility



ALUMINUM BUMPERS OFFER...

Fabricating Savings. Depending on size and design, formed extruded aluminum bumpers can be fabricated with a per bumper saving of \$1.25 to \$3.00. An average saving of \$3.00 to \$4.00 per car is very realistic. Reynolds work with forming techniques has demonstrated that complex shapes can be formed without sacrifice of mechanical properties and without impairing brightness of the rust free anodized surface.

Important Weight Savings. Current bumpers average out at 36 to 40 pounds. Comparable designs in aluminum weigh 15 to 22 pounds. Average weight savings per car with aluminum bumpers are estimated at around 40 pounds. Aluminum bumpers can cut "overhang" weight, give brakes less load to stop—aid in the overall automobile design programs to reduce deadweight and improve car performance.

Styling and Design Versatility. Deep recesses or grooves can be easily designed into aluminum bumper extrusions to achieve styling effects that cannot be accomplished with other metals. Also, aluminum extrusions can be anodized to full thickness even though grooves and recesses and sharp corners are specified. This cannot be done with plating processes on other metals. For

this reason, it is safer to design with aluminum from the standpoint of customer satisfaction and warranty costs. Contrasting colors can also be added through the use of organic finishes—paint films adhere to anodized aluminum much better than to other bright trim materials.

Strength. Average material in the conventional bumper has a yield strength of between 25,000 and 30,000 pounds per square inch. Aluminum alloys used by Reynolds in sample bumper fabrication have a yield strength of 31,000 pounds per square inch. Reinforcing members integral with the extrusion can be easily designed into the bumper for even greater strength.

For information and assistance on aluminum automotive applications, talk to a Reynolds Aluminum Specialist. Write or phone Reynolds Metals Company, P.O. Box 5050, Seven Oaks Station, Detroit 35, KENwood 7-5000. Or contact your nearest Reynolds office or write P.O. Box 2346-MW, Richmond 18, Virginia.

NOTE: Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.



REYNOLDS ALUMINUM

the metal for automation

TRADE MARK

Watch Reynolds TV shows—"ADVENTURES IN PARADISE",
"BOURBON STREET BEAT" and "ALL STAR GOLF"—ABC-TV.

WELDING

Primary Production Method For Motor Vehicles



Gas welding truck cab on the assembly line at Mack Trucks' Allentown, Penna., Division

Gas Welding Provides Versatile and Economical Tool for Assembly-Line Operations

PART V

By
Norman M. Lloyd
MARKETS EDITOR

WITH relatively few cracks in the armor, gas welding, the "old pro," is bucking an industry trend toward highly specialized welding techniques. Although overshadowed in recent years by the spectacular advance of arc and resistance welding, torch welding is serving the automotive industry in a number and variety of ways that are unmatched by any other process.

A fresh look at the role it is playing in today's manufacturing picture shows it to be a highly versatile, efficient and economical production tool.

The Process

Developed over half a century ago, gas welding is a general term applied to all processes employing a flame as a heat source for the joining or fusing of metals. The process includes welding with or without the application of pressure and with or without the use of filler metals. It consists of applying a localized flame of intense heat to pieces of base metal. When they become molten and form a puddle, they are fused as one.

Most gas welding is done by hand, but for specialized work where speed, accuracy and economy are required, the process has been mechanized. Machine welding torches and tube welding machines have been developed. Cutting with oxy-acetylene has also been automated with the introduction of circle-cutting, straight-line cutting, bevel-cutting and shape cutting machines.

The specific requirements of the work to be performed naturally dictate the type of weld to be used, but in most cases, a filler metal is added to the joint in the form of a rod of metal, similar to the base metal to be joined.

Another technique sometimes used is pressure gas welding. This

Metal	Flame Adjustment	Flux	Welding Rod
Steel, cast	Neutral	No	Steel
Steel pipe	Neutral	No	Steel
Steel plate	Neutral	No	Steel
Steel sheet	Neutral	No	Steel
High-carbon steel	Slightly oxidizing	Yes	Bronze
Chromansil steel	Reducing	No	Steel
Wrought iron	Neutral	No	Steel
Galvanized iron	Neutral	No	Steel
	Slightly oxidizing	Yes	Bronze
Cast iron, gray	Neutral	Yes	Cast iron
	Slightly oxidizing	Yes	Bronze
Cast iron, malleable	Slightly oxidizing	Yes	Bronze
Cast iron pipe, gray	Neutral	Yes	Cast iron
	Slightly oxidizing	Yes	Bronze
Cast iron pipe	Neutral	Yes	Cast iron or base metal composition
Chromium-nickel steel castings	Neutral	Yes	Base metal composition 25-12 chromium-nickel steel
Chromium-nickel steel (18-8) and (25-12)	Neutral	Yes	Columbium stainless steel or base metal composition
Chromium steel	Neutral	Yes	Columbium stainless steel or base metal composition
Chromium iron	Neutral	Yes	Columbium stainless steel or base metal composition

Welding Data — Ferrous Metals

method involves the application of pressure without the use of filler metal. In the open joint method, the faces of the metal to be joined are heated by the gas flame to the melting temperature, and then brought into contact for upsetting. Butting the faces together under pressure and heating with the torch until upsetting occurs is referred to as the closed joint method.

While gas welding actually fuses two or more pieces of metal together, brazing joins them by use of a lower melting point alloy (above 800 F but below the melting point of the base metal) which bonds to the metal to be brazed. As the name implied, the heat is provided by the gas torch. Brazing filler metal is most commonly fed from hand-held brazing rod or wire, but can be preplaced in the form of rings, washers, slugs, powder, etc. In all cases, proper cleaning and fluxing are essential.

Most types of iron and steel can be gas welded. Because high carbon steel hardens and becomes brittle in the weld area upon cooling, it is necessary to take special precautions in the form of pre-heating and post-heating to retard cooling. Similarly, cast iron can be welded if these precautions are observed.

There are a number of fuel gases used in torch welding and brazing—acetylene, hydrogen, natural and artificial gases. Their properties, when burned with oxygen, are considered satisfactory when (1) the flame temperature is high, (2) there is sufficient heat to overcome heat losses, (3) the flame is free of impurities and (4) there is a minimum reaction of the flame with the metals being melted (oxidizing and carbonizing).

Although acetylene is used to a much greater degree than hydrogen, the latter is employed to a limited extent in the welding of aluminum and other low melting tem-

perature metals. One of the disadvantages of hydrogen, however, is that its flame is almost colorless, making proper flame adjustment difficult.

Artificial and natural gases are generally unsuitable for most welding applications because they are highly oxidizing at fuel ratios great enough to produce workable heat transfer rates. City gas, natural gas, propane and butane are the most common gases in this category and are often used for brazing and silver soldering.

Oxyacetylene

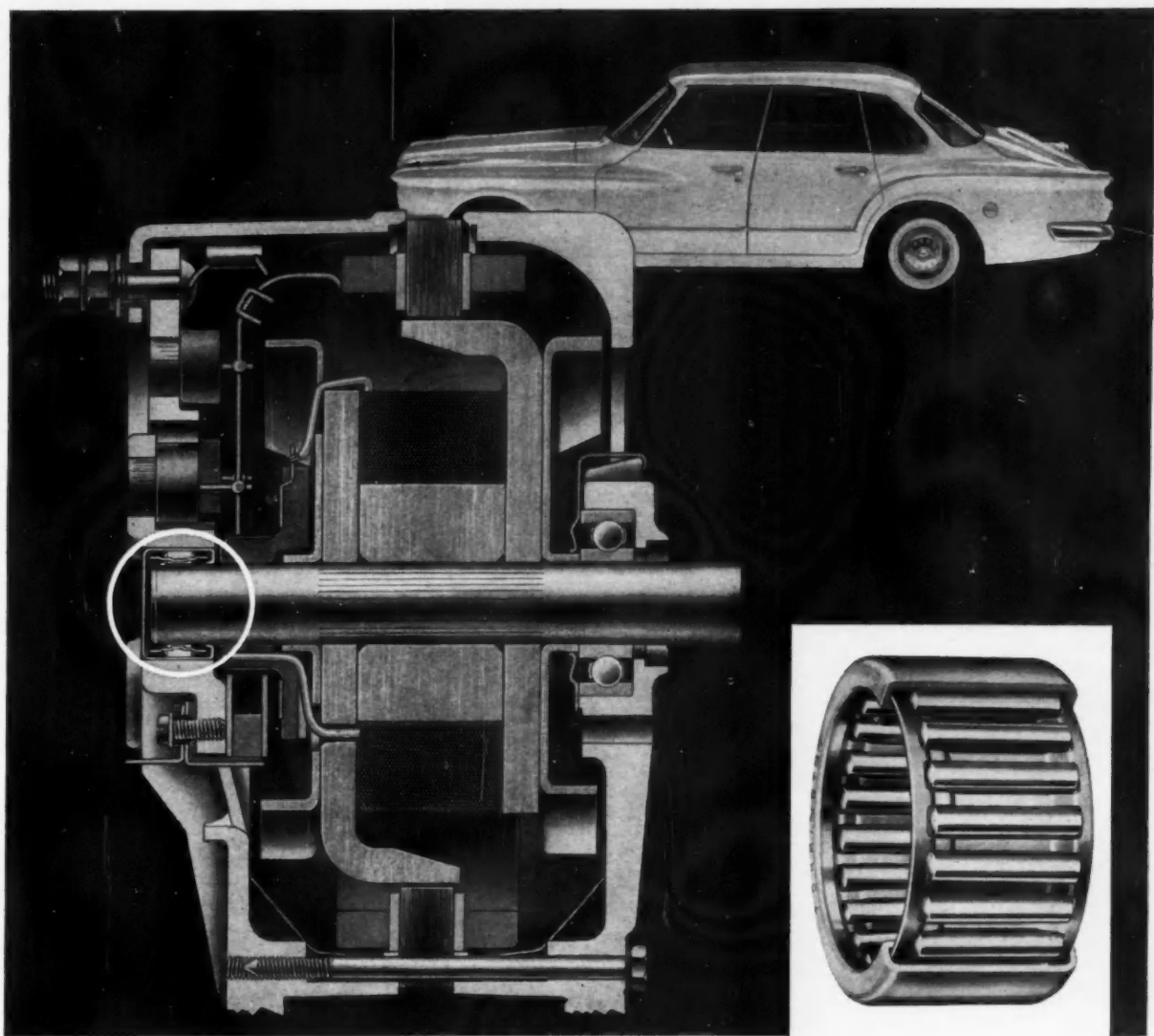
Acetylene is, by far, the most commonly used combustible gas for welding and torch brazing in the production of vehicles. The oxyacetylene flame is so intense (6300 F) that it is far above the melting point of most all commercial metals. It readily provides a rapid, localized and completely con-

Metal	Melting Temp. Degrees F
Steel (.20%)	2800
Iron, Gray cast	2200
Copper	1920
Bronze (cast)	1650
Brass (yellow)	1640
Aluminum	1215
Zinc	785
Lead	620
Tin	450

trollable source, of heat with no harmful effect on the metal. The elimination of carbonizing and oxidizing are controlled by the proportion and mixture of the two gases, oxygen and acetylene. A perfect combination of both is known
(Turn to page 65, please)

Assembly of the Falcon at Ford's Milpitas, Calif., plant includes a variety of gas welding and torch brazing operations

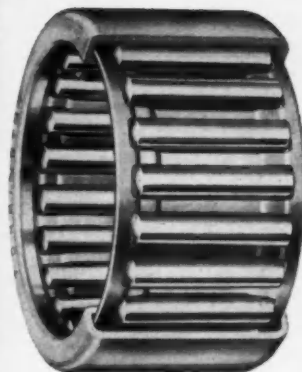




Torrington Drawn Cup Roller Bearings Used in Valiant's Alternator

Compactness, efficiency, economy, reliability . . . these are outstanding features of Chrysler Corporation's exciting new small car . . . and of Torrington Drawn Cup Roller Bearings. Used by Chrysler in the Valiant's new alternator system for electrical power generation, these bearings provide smooth, trouble-free operation and long service life without need for relubrication.

Torrington Drawn Cup Roller Bearings offer performance advantages in all types of generators and appliance motors. The cost is remarkably low . . . in many cases, armature bearing costs have been lowered by as much as 50%. For advice on the application of Torrington Drawn Cup Roller Bearings to your specific problems, call or write your nearest Torrington district engineer.



Armature-mounted Torrington Drawn Cup Roller Bearings offer these outstanding advantages:

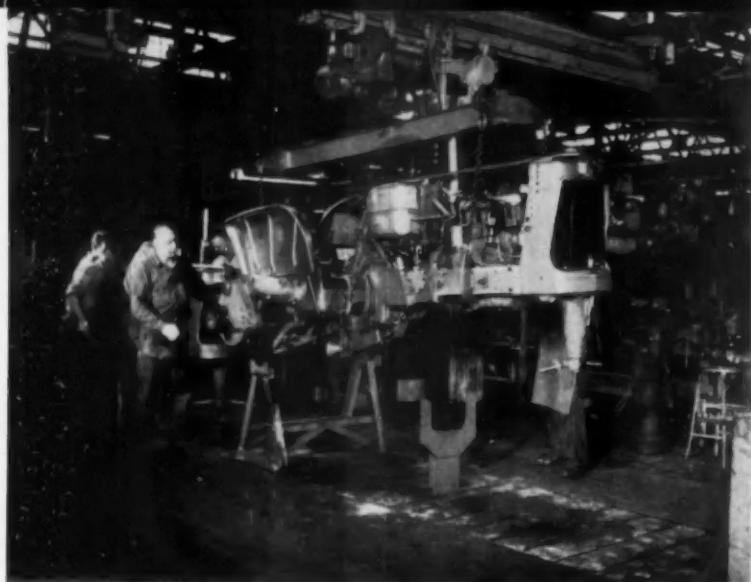
- Highly efficient roller guidance
- Ample provision for lubricant storage and circulation
- High capacity in small cross section
- Long pre-greased service life
- Outstanding efficiency at high speeds
- Easy mounting by press fit
- Simple housing design
- Low unit cost

progress through precision

THE TORRINGTON COMPANY

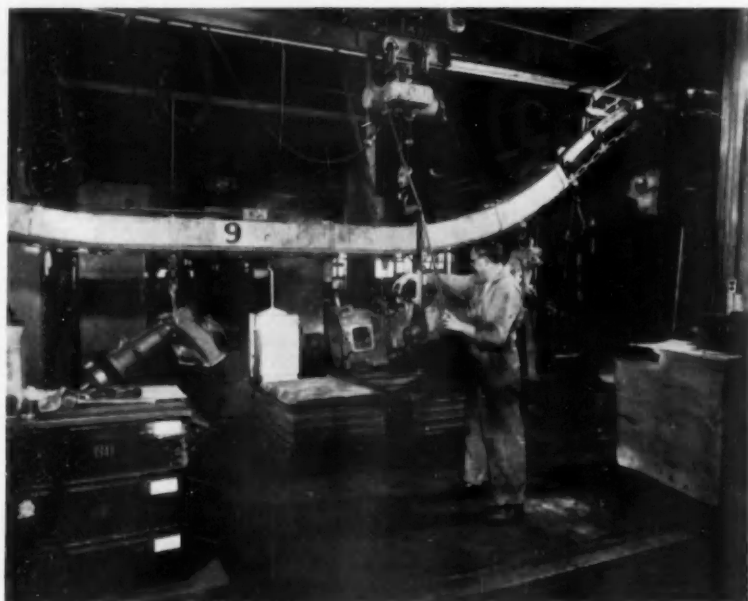
TORRINGTON BEARINGS

Torrington, Conn. • South Bend 21, Indiana



Assembling D-17 tractors at A-C's West Allis Works

A transmission housing starts on the subassembly line



Part of the assembly line for Allis-Chalmers D-17 tractors



REPORT FROM THE FARM EQUIPMENT INDUSTRY

Scheduling Farm Tractor Production at Allis-Chalmers

By Kenneth Rose
MIDWEST EDITOR

PLANNING for production of agricultural machinery has become much more complicated in recent years, as machinery sales move from a regional basis to a national and international basis. The increasing number of crops for which operations have been mechanized is another factor affecting production planning, for even when standard machinery is used, some modifications of the machine must be made for maximum efficiency. All of these end use conditions mean that a wide variety of equipment must be made, and, to obtain the cost savings of mass production, must be made on high production assembly lines.

Typical of the problems are the requirements for agricultural tractors at Allis-Chalmers Manufacturing Company's Farm Equipment Division. While these tractors are produced in four size ranges, there are literally hundreds of models available. All are made in standard assembly lines, with the production controls set up to provide for a wide range of special features as requested by the purchasers.

(Turn to page 94, please)

DEALERS TALK \$\$\$ ABOUT BUTYL TIRES

Up and down the country, dealers are making money on the new, super-safe tires of Enjay Butyl. Here's what they say . . .

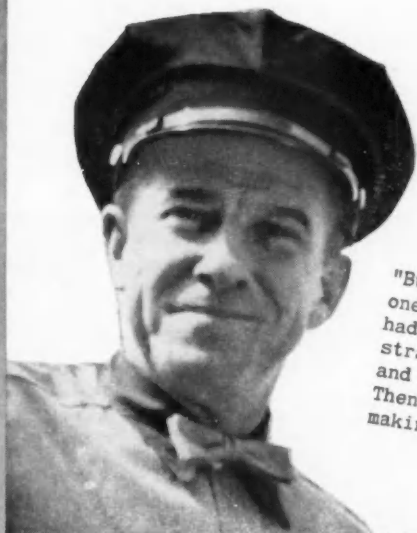
“The markup on the Butyl tires, using the exchange price, is \$8 to \$9. I can't see cutting the price on them—we have the only tire on the market like this. They're easy to sell at the exchange price and net some \$35 to \$40 profit on the sale of a set—not counting what you get from selling the used tires.”

“I sold 4 new Butyl tires for \$174 and got 4 used tires on the trade-in. I sold the used tires right away for \$26 and made a profit on the 2 sales of over \$65.”

“I sold a set of Butyl tires on a 1959 Chevrolet recently; the customer was sold on the tire on the basis of advertising such as “No Squeal”, better traction. The tires on his car had about 6,000 miles on them and I sold them for \$38 - - - extra profit.”

“I give them \$15 per tire trade-in and they get a premium Butyl tire costing less than other premiums. I've had actual sales for tires that people could get 10,000 more miles out of, but they saw the Butyl ad on TV and wanted to have them on their car. So I sell 'em.”

“Butyl tire advertising really sold this one fellow who came in with tires that had about half the tread left. A demonstration of Butyl tires convinced him, and I sold him a set at a profit of \$34.90. Then I sold the used tires for \$16, thus making \$50.90 on everything.”



That last dealer comment points a lesson — one short demonstration ride proves the unique advantages you claim for tires of Enjay Butyl . . . no screech on any curve, up to 30% faster stopping, much less shock, vibration and road noise. **Ask your supplier for profitable tires of Butyl.**

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

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News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Tape-Controlled Equipment, New Furnaces and Crucibles, and New Shell Core Making Machines Will Be Among the Exhibits at the 1960 Castings Exposition

New Foundry Equipment To Be Displayed

The 1960 Castings Exposition at Philadelphia on May 9-13 is slated to present many new developments for the foundry industry.

Several areas of Philadelphia's Convention Hall will be used for demonstrating such operations as sand preparation and conditioning, sand molding, shell mold and core making, melting and pouring of molten metal, shakeout, cut-off, and finishing — employing latest techniques.

Equipment advances will be represented by the furnaces, molding, casting and related machines and equipment on display. New equipment will include induction furnaces for semi-continuous vacuum melting and precision casting operations; and a new line of shell-core-making equipment. Also an improved automatic roll-over machine, and new crucibles which melt and hold aluminum with virtually no metal contamination. Even tape-controlled equipment is scheduled to be on exhibit for the first time.

Among the materials handling equipment group will be a heavy-duty vibrator setup, and a pneumatic conveyor system which automatically delivers metal chips to the cupola in measured amounts. New systems will include a pallet line system for automatically handling molds.

New materials on view will be shell resins with improved thermal-shock properties, and magnesium plunging alloys. Others will be pre-alloyed furnace charges for stainless steel and nickel alloy foundries, binders for oil sand systems, and suspension agents.

Quality control items to be exhibited are new moisture testers, meters for determining the permeability of molding materials, hot shell tensile testers, hydrogen analyzers, and portable X-ray equipment.

In all, more than 240 producers of equipment, materials, and supplies will participate in the Exposition.

Machine Tool Directory Due for Early Release

A revised Directory of Metal-working Machinery will soon be available from the Department of Defense. Although the exact date of publication and price have not been officially announced, the book is expected to be ready sometime next month.

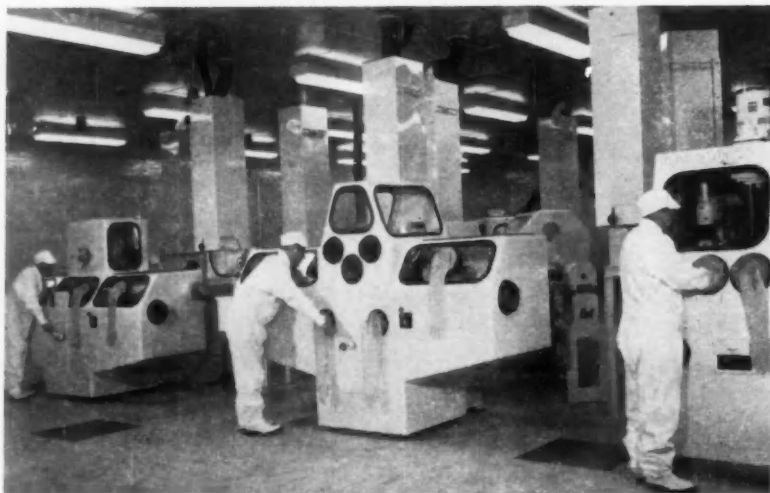
The directory will list, as completely as possible, manufacturers' items for use of military departments. The listings are being coded to eliminate lengthy descriptions. Coding will be the system used generally by manufacturers when reporting to the Business and Defense Services Administration.

The new book will be in two volumes; and the plan is to issue future annual supplements.

This directory — as well as others in the works on Welding, Heat-Cutting and Metallizing Equipment; Test Equipment; Heat-Treating Furnaces and Ovens; Portable Machine Tools; and Woodworking Machinery — will be utilized in the military's

(Turn to page 78, please)

British Setup for Machining Beryllium



This is how machining operations on beryllium are being handled at the new Armstrong Whitworth plant in England. To eliminate the hazards of dust from beryllium, the machine tools are totally enclosed and sealed. Internal access to the work is possible only through rubber gloves. As an added precaution, workers' protective clothing is laundered after each shift. Also, the machines have high-speed extraction systems, and the air leaving contact areas is purified before being exhausted through 120-ft chimneys to atmosphere.

ALL ACROSS AMERICA . . .



More Steel Service Centers than ever stock BLISS & LAUGHLIN cold finished steel bars

This fact means superior service when you specify Bliss & Laughlin cold finished steel bars, for two reasons:

1. Bliss & Laughlin has the *most complete* and *most flexible* mill service in the industry.
2. Because more Steel Service Centers than ever stock Bliss & Laughlin bars, every metalworking plant can now get especially fast *local* service.

Analyze your "cost of possession" of cold finished steel bars. Perhaps you'll see, too, why so many buyers depend more and more on their Steel Service Centers to help them lower "cost of possession" expenses.

Talk over your cold finished steel bar requirements with your Steel Service Center. Those stocking Bliss & Laughlin bars will give you *outstanding* service (we know, because we've seen them in action!).

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**Cold Finished Steel Bars In Carbon, Alloy, Lead
Carbon and Lead Alloy Grades**

LUSTERIZED® COLD DRAWN
COLD DRAWN, GROUND AND POLISHED
TURNED AND POLISHED
TURNED, GROUND AND POLISHED
STRAIN-TEMPERED® CARBON BARS
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Specialists in Finish, Accuracy, Straightness, Strength and Machinability

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*Leading
Independent
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NEW

PRODUCTION and PLANT

EQUIPMENT

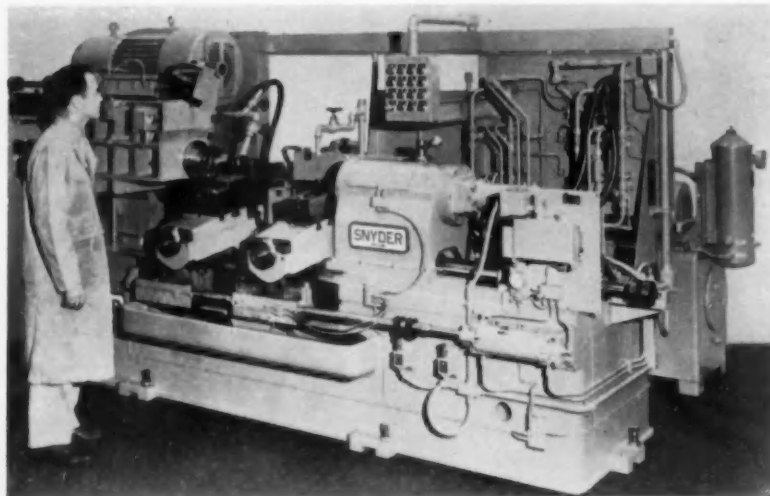
By C. J. Kelly
ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Multi-Operation Heavy Duty Automatic Lathe

A NEW special heavy-duty automatic lathe completely rough turns and faces eight different lengths and

diameters of forged steel automotive axle shafts with carbide tools at a rate of 105 pieces per hour at 100



Heavy duty automatic lathe rough turns and faces eight different dimensions

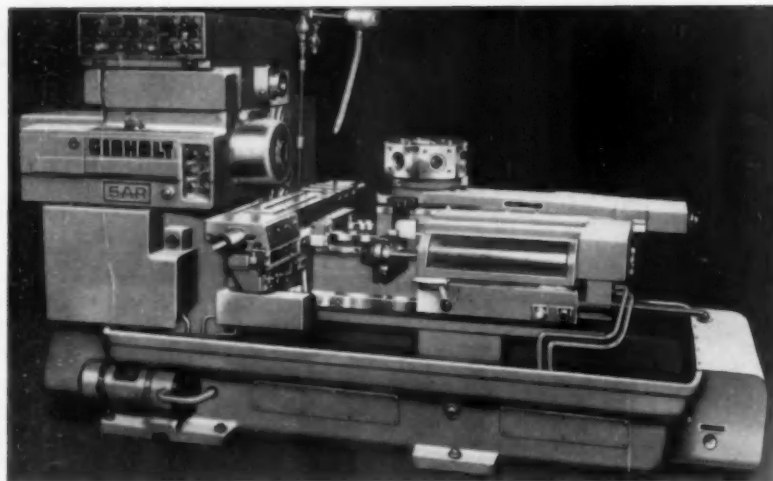
pet efficiency, according to reports.

The machine rough straddle-faces the flange; rough turns the flange, oil seal and bearing diameters; rough turns the flange pilot diameter; and rough turns the spline diameter on the opposite end of the shaft.

This unit has a hydraulic cylinder-operated overhead slide that provides the flange pilot turning function. A rear slide, in-fed by a hydraulic cylinder, straddle-faces the flange. Two pivot-mounted turning slides are at the front of the work. The pivoted slides are each independently rocked down to permit loading and unloading of the work. Hydraulic cylinder-operated cams raise the slides into adjustable micrometer stop positions for the turning operation. Axial slide advance to the left for turning is made by another hydraulic cylinder. A 40-hp motor drives the headstock through an externally mounted air brake and clutch mechanism that permits stopping and starting of the drive spindle within one second. Snyder Corp.

Circle 43 on postcard for more data

New Automatic Ram Type Turret Lathe

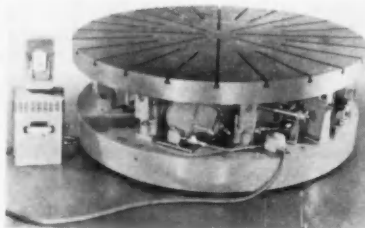


Two models are available of the new automatic turret lathe that has been introduced to the metalworking industry. The 4AR features a 2 in. bar stock capacity and the SAR will handle stock up to 4 1/2 in. Gisholt Machine Co.

Circle 44 on postcard for more data

Giant Rotary Table

WITH a bearing load capacity of 90,000 lbs a new precision horizontal rotary table measures 102 in. in dia. In spite of its size the table is claimed to have an accuracy of 5



seconds of an arc. Additional features include adjusting speed motor drive from zero to 1/3 rpm, and the high capacity cone worm gearing with positive backlash controls deenergized self-locking brake. Machine Products Corp.

Circle 45 on postcard for more data

Vertical Airflow Oven

NEW design for ease of operation is the feature of a line of mechanical recirculating vertical airflow utility ovens. Effective use of a turbo-blower, heavy duty motor and special

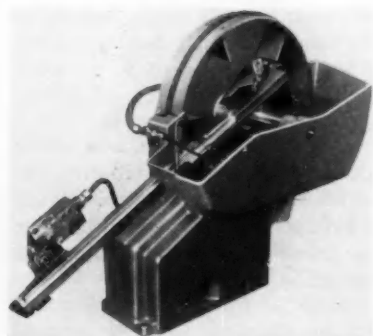


design result in vibrationless airflow. This line has a temperature range of 37.8 to 260 deg C. An automatic trigger control has a response sensitivity of $\pm \frac{1}{2}$ deg. *Blue M Electric Co.*

Circle 46 on postcard for more data

Compact Parts Feeder

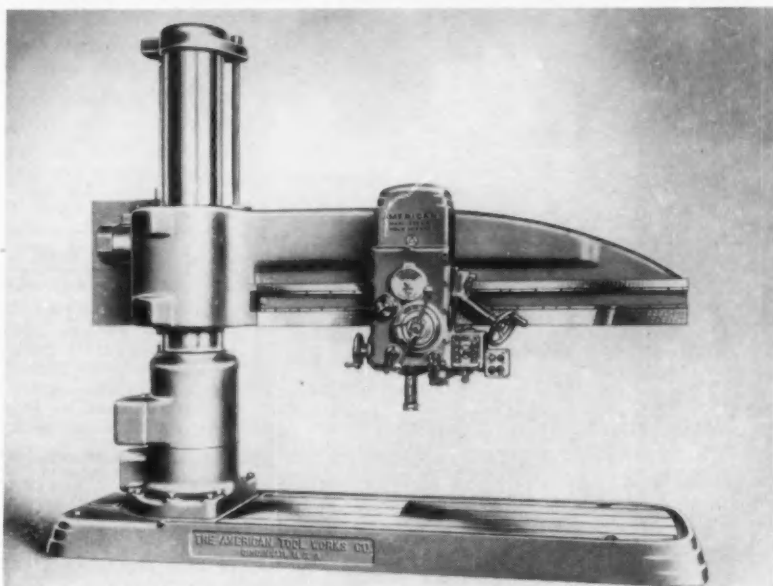
A NEW Standard parts feeder, designated model FE-103, is reported to be capable of handling up



to 200 parts per minute. It has a motor driven drum, variable speed control, and was designed for compactness. This unit will find use in the dial-index or in-line transfer operations. It measures 10½ in. wide, 22 in. high and the drum dia is 16 in. *Dixon Automatic Tool, Inc.*

Circle 47 on postcard for more data

Radial Drill Line Features Twelve Spindle Speeds



A newly designed line of radial drill presses will handle drilling and tapping requirements up to 2 inches in steel. They are available in column diameters from 13 to 19 in., and arm lengths of 5 to 14 ft. In addition to manual feeds, the head provides 12 spindle speeds with 3 optional ranges, plus 6 power feeds with 2 optional ranges. *The American Tool Works Co.*

Circle 48 on postcard for more data

"Mass Production" Machining of Carburetor Bodies

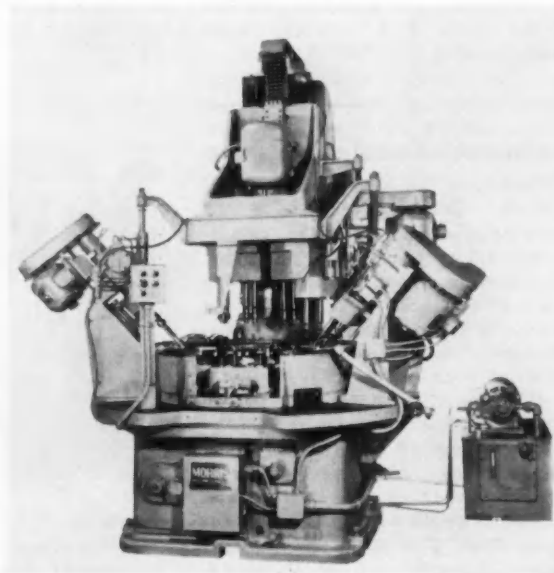
FOUR barrel carburetor main bodies are processed at the rate of 375 per hour by a new load-transfer type production machine. This unit drills, faces, reams and taps the wide variety of straight and angular holes required for the bodies.

Parts are cycled twice around the table, achieving an initial savings by reducing the number of drill units

required. Double fixtures are used. With each indexing a finished part is removed from the second position of the fixture, a part is moved from the first to the second position and a fresh unit is started in the first position. A single lever clamps both parts. The fixture is automatically unclamped by the machine. *The Morris Machine Tool Co.*

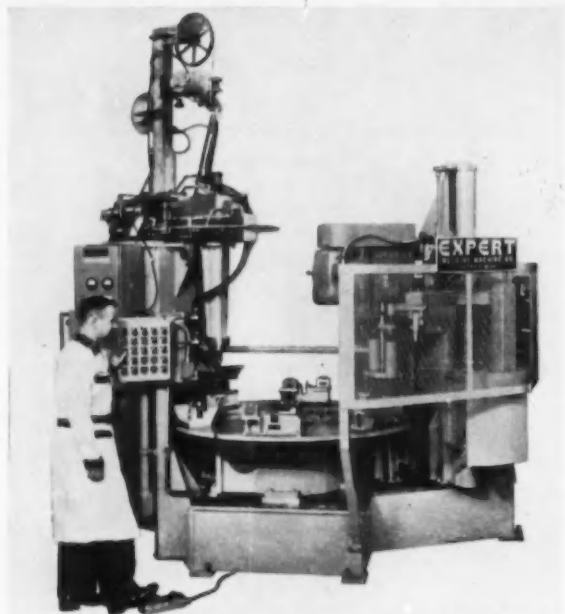
One of the main features of this production machine is the five station automatic index. After the unit that is to be machined is clamped into the proper position the operator will index the fixture in two complete cycles.

Circle 49 on postcard for more data



NEW PRODUCTION EQUIPMENT and PLANT

Welding Machine Combines Production Operations



A six-station rotary index automated welding machine combines assembly, CO₂ shielded arc welding, reaming and spotfacing operations in the production of motor mount brackets. According to the manufacturer, the production on this machine is 360 parts per hour at 100 pct efficiency.

Circle 50 on postcard for more data

WITH this automated welding concept, part production costs are substantially reduced as a number of operations are combined in one machine. Combining operations provides: maximum production rates, reduced floor space requirements, simplified part handling and quality controlled parts.

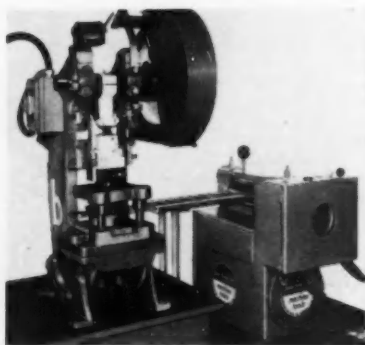
The machine illustrated press assembles a spacer into a motor mount bracket assembly, welds the spacer to the motor mount in a 360 deg rotary welding operation, and simultaneously reams the inside diameter of the spacer and spotfacing the end of the spacer flush with the motor mount bracket.

The index table is driven by the Expert standard cam index drive. This mechanism consists of a motor driven barrel cam which engages a series of cam followers attached to the table drive plate. The high torque rating of this index drive permits indexing the 1100 lb table, including fixtures, from station to station in 1.6 seconds without any shock or impact. The cam groove is accurately generated to produce controlled acceleration and deceleration of the table to permit rapid, shock-free indexing. The dwell portion of the cam groove accurately positions the table "in station." *Expert Welding Machine Co.*

Automatic Feeding Machine

KNOWN as the MAF machine, this new Benchmaster development automatically feeds uniform, pre-determined lengths of material to any secondary machine. It consists of a friction type roll feed mechanism driven by a constantly running electric motor-driven flywheel. A solenoid-operated clutch-brake unit instantly engages the rolls or stops roll motion upon disengagement.

An adjustable length measuring control (timer) can be pre-set to continuously and automatically produce any work length within the machine's range from 3 to 60 in. Micrometer control permits work length adjust-



ments to 1/32 in. or less. *Benchmaster Mfg. Co.*

Circle 51 on postcard for more data

Expanding Demand for Industrial Engines

(Continued from page 40)

Conclusion

The market for industrial engines seems to be "going places," as indicated both by the foregoing and the following comments:

Clyde W. Truxell, general manager, Detroit Diesel Engine Div., GMC—"Engine shipments during 1959 represented an increase of over 2 million horsepower over 1958."

George W. Balch, OEM sales, Minneapolis-Moline Co.—"Outlook for new business is about the same as last year, but the inquiries for specialized applications would indicate a sizable increase in business toward the end of 1960 and in 1961."

William Kusz, advertising manager, Market Services Department, Caterpillar Tractor Co.—"In general we feel there is a long-term and steady growth in the Diesel and natural gas engine markets."

Bernard C. Ball, advertising manager, White Diesel Engine Div., The White Motor Co.—"Our January 1960 business experienced a 25 per cent gain over January 1959. We expect a probable 10 per cent gain in 1960 sales over 1959. Our inquiry activity for the month of February increased 30 per cent over the months of November, December and January."

N. A. Prusinski, manager, market research, Cummins Engine Co.—"We believe the industrial engine market to be a growing one, with the Diesel portion growing most rapidly."

James A. Currie, sales administration manager, Willys Motors, Inc.—"Our industrial engine business showed an increase in 1959 of about 40 per cent over 1958. Present prospects for 1960 indicate that we may expect a somewhat similar increase for this year over last." ■

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AUTOMOTIVE INDUSTRIES, May 1, 1960

WELDING—Part V

(Continued from page 56)

as a neutral flame and is easily recognized by a smooth inner cone of the torch. The oxygen burns up the carbon and the hydrogen in the acetylene and releases only heat and harmless gases.

The scope of oxy-acetylene operations generally includes fusion welding, bronze welding, bronze surfacing, hard facing, brazing and soldering. The intense heat of the flame is also used for preheating, hardening, softening, forming and surface priming. In the production of passenger cars and trucks, however, the process is confined to "security" welding and torch brazing operations.

Oxy-Acetylene Welding Equipment

The equipment for oxy-acetylene welding is simple and inexpensive. Basically, it consists of a supply source for the two gases and a system for delivering the gases to a tip, at which point they are mixed, ignited and a high temperature flame produced. In its simplest form, the following apparatus is used for the welding of most all commercial metals:

- a. gas cylinders
- b. pressure regulators
- c. pressure gauges
- d. hoses
- e. welding torch
- f. goggles
- g. friction lighter

Although a manifold oxygen supply system with an acetylene generator or manifold acetylene supply are sometimes used for larger volumes of work in repair and metalworking operations, the essential equipment is the same. For purposes of this report, only the basic components are discussed.

Commercial oxygen is stored in cylinders that are furnished by gas manufacturers. The oxygen cylinders are one piece forged high carbon steel and carry a pressure of 2200 psi. A pressure safety valve is incorporated in the upper end of the cylinder. Referred to as a "back seating" valve, the stem is

sealed to prevent leakage when the valve is turned all the way out.

The acetylene cylinder is normally shorter and of a larger diameter than the oxygen cylinder and different in construction. Acetylene cannot be stored as a pure gas at pressures greater than 15 psi. To eliminate this problem of direct compression, the cylinder is packed with a bulky substance that is filled with acetone, a liquid chemical that has the unique ability of dissolving large volumes of acetylene. In this way, the acetylene is stored safely, and large quantities stored in a relatively small space.

Since pressures at which oxygen and acetylene can be used at the torch are much less than those at which the gases are stored in the cylinders, pressure regulators are incorporated into the system to (1) reduce these pressures to workable values, and (2) to maintain this pressure without fluctuation. Each regulator has two gages, one indicating cylinder pressure and the other showing the pressure in the gas hose. A simple hand screw adjusts the pressure. Oxygen regulators differ from acetylene regulators in that they must withstand higher pressures, both at the cylinder and for working pressures at the welding torch. Safety devices in the working pressure stage of the regulators will vent-off gas in cases of excessive pressure due to faulty valves.

Pressure gauges for oxygen regulators usually read to 3000 lb to accommodate the full cylinder pressure of 2200 psi. An inner scale indicates the cylinder contents in cubic feet at 70 F. The working pressure gauge reads to 100 lb for welding, but for cutting, which requires higher pressure, the gauge is calibrated to 400 lb.

Acetylene regulator gauges read to about 350 lb cylinder pressure. As previously discussed, acetylene should never be used at pressures greater than 15 lb, so the working pressure gauge is only calibrated to 15 lb.

Hoses connect the gas regulators to the torch and are clearly marked and color coded—green for oxygen

and red for acetylene. Standard sizes for oxy-acetylene hoses range from 1/8 in. to 3/4 in. in inside diameter.

Torches used for welding and cutting are classified as either injector or equal pressure type. Although differing slightly in construction, they are made up of four main parts: hand valves, mixing chamber, body and tip.

The injector type is based on the Venturi principle. The force and speed of the oxygen are used to literally suck the acetylene into the mixing chamber. The equal pressure type depends upon the pressure of each gas to force itself into the chamber. The equal pressure torch, generally used with cylinder gas, is used to a greater degree than the injector type. The latter is more commonly used with low pressure systems and generators.

Most torches are equipped with interchangeable heads or tips to handle a variety of different operations. These tips vary in size and are numbered from 0 to 15. This code indicates the pounds of pressure of oxygen and acetylene to be used.

The oxy-acetylene cutting torch is not unusual with the exception of a separate and additional opening for oxygen in the tip and an additional oxygen valve on the torch. Some cutting torches have as many as eight openings for the heating flame, in the center of which is a larger opening for oxygen.

Accessory articles, such as goggles and gloves, should be used to protect the welder from burns and harmful ultraviolet and infrared rays. A flint or steel friction lighter is also recommended since it provides a local ignition that is self-extinguishing as well as non-combustible.

Welding Rod and Flux

Aside from proper technique, correct preparation of the welding edges and the accuracy of the flame adjustment, a good weld can only be produced by the right choice of welding rod, and, if required, the correct flux.

It is not always enough to state
(Turn to page 76, please)

SAVE SAVE
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Real Money on
Trichlorethylene?

DETREX Customers Save Thousands of Dollars Per Year

Although solvent degreasing is a most economical method of metal cleaning, operational studies often result in trichlorethylene savings of 15%.

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This results from the fact that changes in manufacturing processes, which cause excessive solvent consumption, often go unnoticed.

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FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Heat Resistant Paint

A high heat resistant paint has been developed to protect steel jigs, fixtures and formed products during brazing and welding operations. It



is known as Heat-Rem H-170 Super. It is reported to withstand temperatures of 1700 deg. This paint is recommended for fine tolerance operations and can be applied by spray, dip or brush. *Specco, Inc.*

Circle 52 on postcard for more data

Bearings for Corvair

A new type of spherical roller-type wheel bearing has been used on the 1960 Corvair. This bearing was de-



signed specifically for the Corvair and is self aligning, permanently lubricated and sealed for life. It meets a set of conditions dictated by the independently sprung rear axles of the

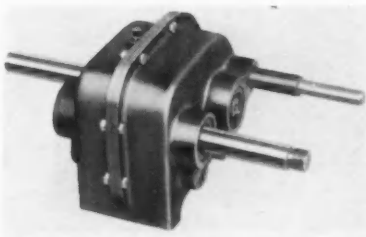
Corvair. The bearings provide support for the axle shafts which are free to swing from the center pivot.

The complete bearing package, with the outer housing, is press fitted to the axle. Four bolts pass through the rear brake flange plate and the bearing retainer to fasten them to the control arm. The bearing compensates itself for any misalignment between the center line of the axle and the bearing outer race when it is bolted into position in the control arm. *Hyatt Bearing Div., General Motors Corp.*

Circle 53 on postcard for more data

Reversing Transmission

A new reversing transmission, named model P-401, has been designed specifically for golf carts and similar applications. Used in combination with a recommended automatic drive, on engines up to 10 hp, the transmission has three positions: forward, re-



verse and neutral. Forward ratio is 3 to 1, reverse is 2.4 to 1 and maximum input speed is 5,000 rpm.

The input shaft is machined to fit the automatic drive. The output shaft is long enough to mount a brake and drive sprocket. The gears in this unit are hardened, precision cut, and rounded for ease of shifting. *The J. B. Foote Foundry Co.*

Circle 54 on postcard for more data

New Truck Alloy

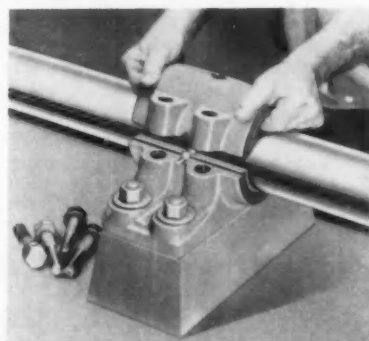
A high strength aluminum alloy has been developed specifically for large truck and trailer construction applications. This new alloy has been

named 5155. It is reported to have high qualities in brightness, strength and the ability to lie flat. This development is available in 0 and H37 tempers and in 0.040 to 0.064 gauges. It comes in widths up to 60 in. and lengths up to 180 in. *Reynolds Metals Co.*

Circle 55 on postcard for more data

Replaceable Liners

BRONZE precision liners are easily replaced in a newly designed pillow block. The pillow block itself, as well as the liner, is divided in two



sections. To replace the liner the top half of the block is removed and the shaft is raised slightly to allow the bottom half of the liner to be tapped out. To prevent the liner from rotating in the housing it is equipped with a brass retainer spool that is recessed between the base and cap. *Dodge Mfg. Co.*

Circle 56 on postcard for more data

Air Suspension System

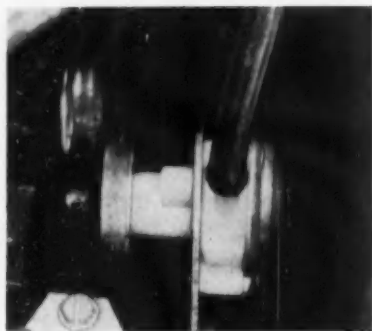
A heavy-duty truck manufacturer has designed, engineered and tested their own air suspension system for application on their trucks. This development, known as Stabilair, eliminates radius, track and torque rods; makes many parts interchangeable; provides complete freedom from lubrication, and incorporates built-in sway control. *Kenworth Motor Truck Co.*

Circle 57 on postcard for more data

Tiny Plastic Pump

One of the first automotive parts made with Du Pont's new plastic engineering material, "Delrin" acetal resin, is a tiny but efficient pump for the windshield washers on the 1960 Fords and Mercurys.

The part, developed by the Delman Company, manufacturers of automobile windshield washers for more than 13 years, is a gear-type, vacuum-



actuated unit driven off the fan belt.

"Delrin" is a tough, rigid thermoplastic, possessing an unusual combination of mechanical properties and dimensional stability. It recently went into full-scale commercial production at Du Pont's Washington Works, in natural color, weatherable black, and a line of standard colors. *E. I. DuPont de Nemours and Co.*

Circle 58 on postcard for more data

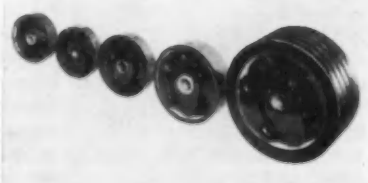
Gasoline Filters

A new line of gasoline filters has been developed for application on the Ford Motor Co. automobiles. Designated the GF-70 and GF-71, they are designed to protect the carburetor from wear, flooding and stalling. *AC Spark Plug Div., General Motors Corp.*

Circle 59 on postcard for more data

Automatic Clutches

A new line of automatic clutches have been announced for application on gasoline engines with a hp range



of 1 to 100. This line is reported to have one third less parts than previ-

ous models. Sealed ball bearings and improved shoe construction are other features that tend to improve the performance of these units. *Power Transmission Div., Salisbury Corp.*

Circle 60 on postcard for more data

All Year Anti-Freeze

Development of an anti-freeze that can be used all year, and year after year has been announced. The new solution will be known as "Telar." In addition to providing protection against freeze-up it also acts as a cooling element in the warm weather.

Another feature of this development is a built-in signal that will warn of a major cooling system breakdown. Named "Color Check" this ingredient changes the color of the Telar from normal red to yellow if there is a leak in the hose connection, water pump, or cylinder head gasket. *E. I. du Pont de Nemours and Co.*

Circle 61 on postcard for more data

"Life-Time" Mufflers

Examination of a specially treated automobile muffler, after 30,000 miles of continuous use for four years, re-



vealed no corrosion or weakened steel, inside or out. This treating process is called cromallizing. It is a relatively new technique for diffusing chromium and other metals into the surface of mild steels, to impart better heat and corrosion resistance. *Chromalloy Corp.*

Circle 62 on postcard for more data

Collapsible Spare Tire

A SPARE tire assembly has been developed that can be inflated from a carbon-dioxide bottle that is supplied with the unit, or conventional equipment can be used. This spare is only one inch thick before inflation. It is designed as an emergency wheel

and is not designed for continuous use. It can be used for a considerable distance, if necessary, with only a slight difference in the car's performance. *The Dunlop Tire and Rubber Corp.*

Circle 63 on postcard for more data

New Cleaning Unit

A NEW Circosonic cleaner that combines the advantages of high frequency ultrasonic cleaning, plus mechanical agitation action in a single unit, has been developed. In the new unit the ultrasonic sound waves loosen the foreign matter from crevices, blind holes and threads, leaving the agitation action to float it away.

A recirculating pump and filter system enables the cleaner to constantly clean its own solution; a temperature control maintains a pre-set temperature throughout the cleaning process.

The unit, called model 1PA-US, is ideal for such difficult cleaning jobs as removing chips and dirt from machine parts; removing polishing, lapping and buffing compounds; and pre-cleaning and coating prior to painting and plating.

The model 1PA-US has overall dimensions of 26 in. long by 29 in. deep by 56 in. high; has a working platform 21 by 18 in.; a liquid capacity of 30 gal; working capacity of 75 lb per load; agitation up to 150 strokes per minute; 4 in. stroke length; and is made of type 321 stainless clad steel.

Generator (PG500) and transducers (two model 4090B's) have an output of 500 W av, 1,000 W peak; frequency of 40 KC; power output of 1,500 W, 115 V, 60 C, 1 ph, weight of 75 lb. Overall dimensions of the units are 19 in. wide by 14 in. high by 15 in. deep. *Circo Ultrasonic Corp.*

Circle 64 on postcard for more data

King-Size Welding Gun

THE latest addition to a broad line of portable spot welders is the new king-size welding gun that has been designated the Aro model 510. This unit is air operated, fully automatic, water cooled, and will weld from the lightest gauge up to 2 by 3/16 in.

This welding device is equipped with a gyroscopic suspension for easy rotation in all directions. *The Powerad Co.*

Circle 65 on postcard for more data

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MIDLAND AIR COMPRESSORS

COST YOU LESS POWER PER CUBIC FOOT OF AIR

Trying to stretch your horsepower? Then save what you have with an efficient Midland Compressor. On the test stand or on the track, you'll see Midland Air Compressors use less power to produce more air—at any speed. Look at the valves . . . check operating temperatures . . . and you'll see why!

Don't take anyone's word for it! Run a test on a Midland Compressor today. We'll be glad to furnish samples.



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Circle 124 on Inquiry Card for more data

69

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By C. J. Kelly

ASSISTANT EDITOR

A PRODUCTION UNIT OF 1965

An integrated manufacturing system that points the way for accelerating the flow of information and material by combining automatic preparation of programs for numerically-controlled machines with methods designed specifically for in-line operation has been conceived and demonstrated by the Westinghouse Electric Corporation's Headquarters Manufactur-

ing Laboratory. Perhaps the most unusual feature of this system is the absence of drawings and the usual paperwork associated with manufacturing operations.

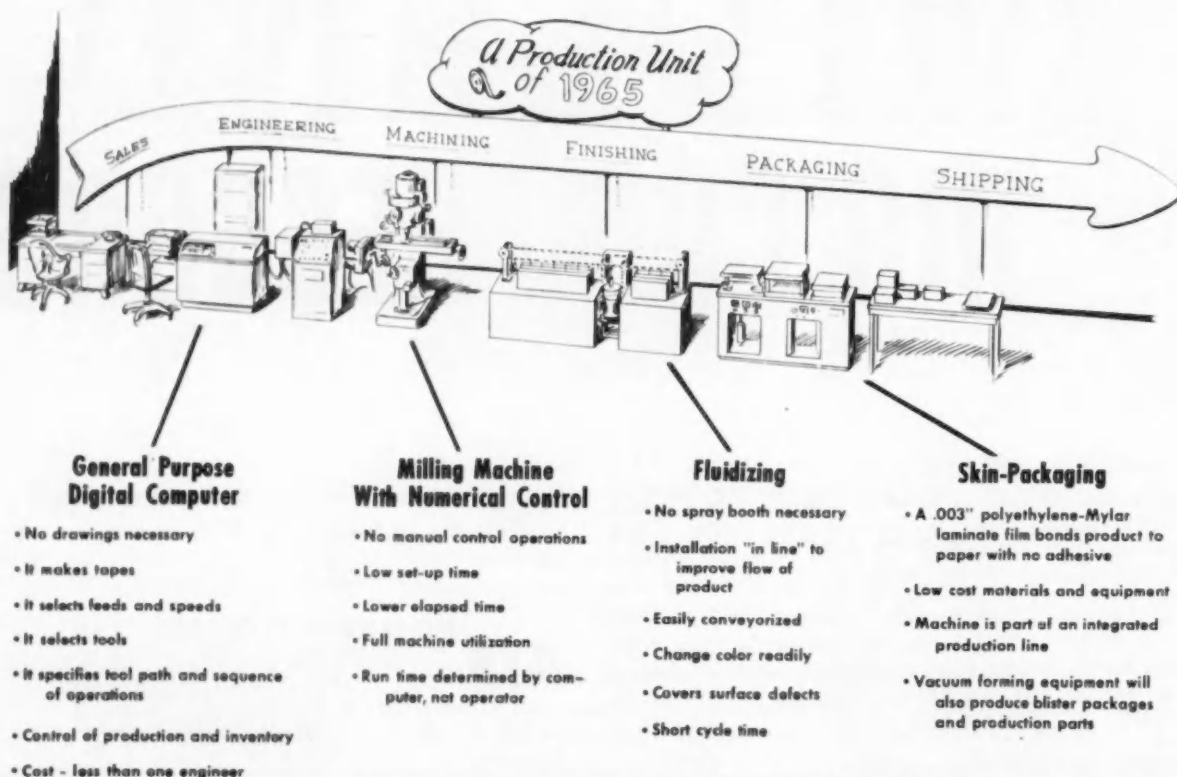
No manually prepared manufacturing information or set-up is required in this system. The plates are cut automatically on a numerically-controlled milling machine as is becoming common, but—they

are made without a separate program for each different piece. A general-purpose computer creates instructions for producing a variety of parts, using only the bare customer-order information.

To start the process, the required initials are typewritten at the computer—see sketch. No drawings or knowledge of cutting sequence are necessary. The computer determines the path of the tool, and produces a punched control tape which feeds into the machine control console. If desired, the computer can select tools, feeds and speeds, and perform inventory control functions in addition, all at less than the cost of a single engineer.

The profile-milling machine is a conventional vertical mill retrofitted with numerical control of three axes, and requires only loading of metal blanks, which could also be automatic if desired. Full machine utilization is achieved since sequence and running time are determined beforehand by the

(Turn to page 75, please)



Total Elapsed Time From Receipt of Order to Delivery of Product—15 MINUTES

METALS

Steel Operating Rate Falls to Below 80 Per Cent and May Go Lower. Lead Sales Improve; and Aluminum Output Rises.

by William F. Boericke

It's no longer popular to refer to the "Soaring Sixties" in the steel industry. Optimism is slipping. The production decline that set in during January and continued slowly for two months suddenly accelerated in early April. From the 90 per cent operating rate that held in March the rate declined below 80 per cent by mid-April with indications that it would slump even lower before levelling off. Blast furnaces and openhearth were taken off stream, men have been laid off and the work week shortened. Brutally stated, the expected boom in steel for the first half of the year has fizzled out.

Inventories Built Up Rapidly

No one seems to have come up with an irrefutable reason for the decline but it's a condition and not a theory. There has probably been a more rapid buildup of inventories than was originally expected to take place. In consequence consumers now appear anxious to get their steel stocks down to the lowest working level. Instead of wanting to have an inventory equal to two months consumption, steel consumers are pursuing a hand-to-mouth policy in buying, and are content to let the mills act as their warehouses, knowing there will be no difficulty in getting steel in the foreseeable future.

Auto Industry Buys Steel Cautiously

While automobile sales had a sudden uplift in late March there is no certainty that this will continue and in the meantime the industry is gearing its steel purchases to the pace of new car or-

ders. There is hope of a strong upturn in June or July when car manufacturers will be looking for steel for the 1961 models. But it's mainly wishful thinking thus far. Call for heavy steel has been hit by delay in construction work that has been hit by inclement weather. The poor demand for line pipe and oil country goods has been the biggest disappointment. This has been blamed on offerings from abroad at lower prices as well as the poor condition of the oil market. There have been cutbacks in the railroad freight car building program. Stainless steel demand has been at low ebb. Most stainless manufacturers kept operating during the strike which ended with their customers in comparatively good shape.

Some Steel Orders Reinstated

The picture is not all bad. Export business in cold rolled sheets is encouraging. It's largely explained by generally prosperous conditions in Europe and in the United Kingdom with foreign mills unable to supply all the demand. And there are scattering indications that the decline in incoming orders is coming to a halt in some areas, notably in Pittsburgh. Some customers are reinstating previously cancelled orders for steel. Galvanized sheets and tin plate are still in good demand. The chances are that there is enough business to permit an average operating rate of about 75 per cent for the industry as a whole and that May will turn out to have been the low month for the first half of the year.

Copper Price Sensitive in World Markets

The sensitive position of copper is well shown by fluctuations on

the volatile London Metal Exchange which accurately reflects world demand and supply. Any rumor that implies a work stoppage at the mines or smelters sends the price of spot copper upward although copper for 90 day delivery remains comparatively stable at the 30 cent level. There has been little doubt that demand for the metal has been much stronger abroad than in the U. S. and especially so on the Continent where copper for early delivery brings a price about $\frac{3}{4}$ cents higher than the price on the L.M.E.

In this country the 33 cent price established by both the producers and the smelters holds temporarily firm although there is general agreement that the summer will see it decline to the 30 cent level. By the end of May the Laurel Hill refinery, long strikebound, should be adding about 14,000 tons a month to the national output. This might bring about the expected price decline. One thing appears certain, that the producers won't initiate a cut before the smelters who have always taken the lead.

Business Poor in the Brass Industry

The brass business has been quite poor, about 25 per cent below the same date last year and about 35 per cent lower than predictions for the "Soaring Sixties." No doubt some of this has been due to inclement weather which has held up housing and auto sales. Also, with so much talk of overproduction consumers prefer to buy from hand to mouth rather than build up depleted inventories. This attitude could change over night. Either the price must come down to encourage reluctant buyers or

(Turn to page 80, please)



How R/M helped design a cooler tractor clutch

Case-o-matic Drive torque-converters on J. I. Case tractors use waffle-grooved R/M sintered bronze friction material in master clutch.

Improved heat dissipation in a forced-cooled clutch resulted from close cooperation between engineers of Twin Disc Clutch Co., Racine, Wis., and Raybestos-Manhattan.

Waffle grooving

As a manufacturer of all types of clutches, Twin Disc has wide experience in the useful application of friction. This knowledge, combined with R/M's friction know-how and laboratory and research facilities, produced a clutch plate of sintered bronze with waffle-type grooving, which improves cooling and lubrication.

Three of these friction plates are used in master clutches of Case-o-matic Drive torque-converter transmissions manufactured by Twin Disc for J. I. Case farm tractors.

For over 20 years, R/M has worked with every kind of friction material for thousands of specialized applications. Only R/M manufactures all types of friction materials. For this reason you can be sure you are receiving sound, unbiased advice from R/M on the material best suited to your application.

Outstanding service

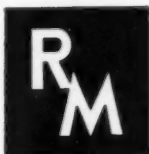
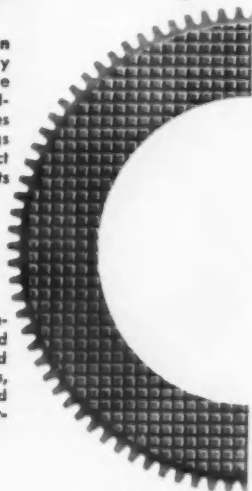
Why not take advantage of R/M's broad experience and outstanding service—an R/M sales engineer can be at your desk within 24 hours.

Want helpful engineering data on friction materials? Send now for R/M Bulletin 501—no obligation.



Unique clutch design revealed in cutaway of Case-o-matic Drive transmission. Balanced-pistons system eliminates clutch release springs and provides compact design. Arrow points to clutch plates.

Waffle grooves improve cooling and lubrication. Sintered bronze friction facings, .022 in. thick, bonded to a 14 gage copper-plated base plate.



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DEPENDABILITY, ECONOMY and STRENGTH are distinguishing characteristics of these sintered metal automotive transmission parts by Delco Moraine. Vital components such as these are typical results of close collaboration between Delco Moraine and its customers—an effective liaison that operates from idea through design and development. They also attest to Delco Moraine's equally important capabilities for making deliveries in quantity and on time!



DELCO MORaine

DEPENDABLY MADE parts for automotive progress • Division of General Motors, Dayton, Ohio

AIR BRIEFS

By R. RAYMOND KAY

Pretty soon, it will be hard to recognize old-line aircraft companies. Their complexion is quickly changing.

In the 1960s, they'll look less and less like planemakers—more and more like large industrial firms.

Many companies are shifting emphasis, merging, and developing new product lines. The big push is to diversify.

What's behind it all? Unstable profits from military business. Many leaders know that at best, it's a feast or famine industry. And it's not quite the bonanza it seems on the surface.

Naturally, the smart thing to do is to move into other fields. And that's just what's going on. Some old-line aircraft companies are now in shipbuilding, industrial equipment, communications, electronics, atomics, and general construction.

It's no secret that almost every planemaker is "looking around." Active merger or outright purchase negotiations are going on with many U. S. and foreign companies. Don't be surprised when you read about them—they're in the works.

Expanding Facilities

Memo to marketers . . . Sure, the aerospace industry has its peaks and valleys. Still, it's constantly plowing more and more money into facilities and equipment. Lockheed's Chairman Robert E. Gross says his company plans to spend \$25 million this year. But more than half of it will go into machinery and equipment for new product development and manufacturing in growth fields.

Lockheed is eyeing these: data processing, controls, automated equipment, and other industrial products.

Missile Program

Pentagon planners have cut the Bomarc anti-aircraft missile program. The money saved—\$300 million—will be used to step up the Atlas and Minuteman projects.

The Atlas and Thor are now operational. Titan and Polaris will be operational this year. But it will be 1963 before the Minuteman is battle-ready.

These missiles probably will be our basic weapons for 10 years or more. That's the opinion of Dan A. Kimball, president, Aerojet-General Corp.

But the Defense Dept. is looking even further ahead. The Air Force has proposals for a third-generation ballistic missile system. Prob-

able range: 9500 mi. North American Aviation, Convair, and Boeing, among others, are competing for the work.

Increased Helicopter Sales

As one segment of the aircraft industry phases out, another takes hold. As reported above, the general aviation market is flying high. It looks as if the helicopter is next in line for the big push.

Stanley Hiller, Jr., president, Hiller Aircraft Co., predicts that helicopter sales will skyrocket tenfold during the 1960s. And within five years or so, there'll be a good market for VTOL aircraft for civilian use.

AUTOMATION NEWS REPORT

(Continued from page 70)

computer, instead of by an operator as needed, and a lower elapsed time for machining results. The operator merely pushes a start button, neither set-up nor any manual control being necessary for any part of the sequence.

Finishing of the part is done by a "fluidizing" method. In this conveyorized operation, the part is preheated and dipped into a bath of dry paint powder. The process covers surface defects and can readily be changed for different colors. It fits well into in-line operations to improve work flow, and since no spray booth is required, it is readily conveyorized.

The name plates are packaged by a "skin-pack" process, in which a laminated polyethylene-Mylar film is heated and vacuum-formed over the part, bonding itself to the paperboard backing without adhesive. This equipment—with its short cycle mechanized operation—lends itself to an integrated in-line

set-up. The same machine will also form "blister" packages for subsequent application to finished parts. Packages produced by this low-cost material and equipment contribute to self-selling of the product by providing high visibility as well as superior protection.

This complete manufacturing sequence is carried through from receipt of customers' orders to delivery of packaged product in fifteen minutes. A significant reduction from a normally expected elapsed time is due, of course, to automatic preparation of information for control of the milling machine.

The combination of this rapid method of preparing information, with physical operations set up for direct in-line flow with minimum cycle time, forecasts great opportunities to by-pass manual operations, eliminate many managed costs, reduce inventories and lead time, and improve quality in Westinghouse manufacturing operations.

WELDING—Part V

(Continued from page 65)

that the rod or wire should be the same as the base metal to be welded. Most commercially used metals contain alloying elements to provide special characteristics such as high strength, corrosion, resistance, etc. During welding, however, the original proportions of these elements is sometimes altered. This requires that some welding rods contain the alloying elements in somewhat different proportions in order to compensate for the change that may occur to the metal being welded.

Welding rods that are entirely different in composition than the weld metal are used for brazing. Steel, cast iron and copper use bronze welding rod; and high silicon aluminum may be used for joining pure aluminum sheet.

Steel welding rods come in various diameters, 36 in. in length. Some are copper plated to prevent rust and are very low in carbon content (.02-.04 carbon).

Cast iron rod is a high grade cast bar free from impurities and

should be used with flux. Brazing rod made of brass or bronze is used for torch brazing.

Aluminum rod and wire should be very high in purity and contain no oxides.

The use of flux is one of the most important factors in weld quality. Fluxes are applied to inhibit the formation of oxides on the surface of the metal to be welded. Unless these oxides are removed, they will weaken the joint and make fusion difficult. If the oxides formed have a higher melting point than the base metal, they will be trapped in the weld causing interference with the filler metal.

Flux is available as a powder, paste or coating. Cast iron and brazing fluxes are usually applied by dipping the heated welding rod into the dry powder. Paste fluxes are brushed on the base metal and painted on the welding rod. Pre-coated rods can be used with or without additional flux.

The most common fluxes in use include cast iron flux, brazing flux for steel and cast iron, aluminum flux, and silver soldering flux. All of these are available in quantity and are clearly labeled to indicate proper use.

AUTOMOTIVE APPLICATIONS

Many assembly line jobs that cannot be handled conveniently by other processes are gas welded. Finish requirements, accessibility, joint tolerance, economy and portability are important factors that influence the role of this process in the production of vehicles.

Passenger car manufacturers use torch heating, welding and brazing for (1) sealing joints that are subject to water leaks; (2) straightening and finishing outer surface body panel damage; (3) welding non-critical missed components; (4) securing critical joints that are subject to torsional stresses; (5) repairing joints that are cracked or have been missed and (6) reinforcing spot welds.

These operations involve the welding, brazing and repair of a great many parts and assemblies such as body pillars and panels, roof bows and rails, windshield

header panels, liftgate header panels, window frames, deck lids, doors and some areas where hemming is used.

Some typical sequence of assembly operations for passenger cars are:

- braze panel-cowl top to pillar front body lower rear
- gas weld pillar front body upper inner to panel windshield
- braze joint of pillar front body upper outer panel-cowl top
- braze pillar center body outer front to pillar center body outer rear and to rail roof side outer front
- gas weld filler quarter-panel upper front to panel-quarter window regulator and pillar outer lock

- braze quarter lock pillar upper to rail-roof side outer front and panel-quarter upper
- braze pillar-quarter lock to panel-quarter upper
- gas weld open joint at panel-quarter wheelhouse-inner, ext. quarter wheelhouse front and reinf.-quarter panel lockside lower
- braze joint of roof panel to rail-roof outer rear

The number of torches in constant use on the production line varies, of course, with plant size and vehicle class. Additional torches are used intermittently for picking up missed components and repairing and securing solder and spot welds.

General Motors, Newport, Delaware, has eight stations of two torches each in constant operation. Ford, Chester, Pa., has eight torches on the line and the main Dodge plant reportedly has 27. In each of the Mercury and Lincoln divisions, 15 to 20 torches are used in the assembly process.

Dodge truck has 10 stations with four welders each. Typical applications and weld sizes for this division are:

Application	Weld, Size, Inches
lock pillar to underbody	4
cowl side to cowl upper	1 1/4
side rear panel to lock pillar	2
hinge pillar to underbody	4
gusset to lock pillar	6
dash to cowl upper	2
hinge pillar to lock pillar	1
drip moulding to hinge pillar	2
cowl side to dash panel	2
side panel	2
underbody	2
cowl side to reinforcement	1
dash to underbody	6

Mack Truck uses eutectic compositions for gas welding and brazing breather pipes, high pressure tube connections for torque converter lines, tank fittings and connections. Sheet aluminum and steel are torch welded on both truck and bus lines where other processes are not sufficiently portable.

The production line applications for oxy-acetylene welding extend into the manufacture of trailers, buses, construction equipment,

East Germans Unveil Industrial Gas Turbine

THE nationalized East German aircraft industry recently displayed a new small gas turbine fitted with dual heat exchangers that are claimed to reduce fuel consumption by more than one third. Designated Pirna 017E, the single-shaft unit has a radial compressor and two-stage axial turbine, and develops a maximum of 130 hp at 32,000 rpm. Fuel consumption at this power is said to be 112.2 lb/hr.

The recuperative heat exchangers are of cross-flow sandwich construction, each having 70 layers of square-corrugated stainless steel. The 0.008-in. sheet, subjected to a temperature of 700 C, is imported from Austria since East Germany is not producing this critical material.

Compressed air from the intake is split into two streams to pass through the heat exchangers, after which the flow reverses through the annular combustion chamber at the rear. Gas from the turbine divides to exhaust transversely across the exchanger cores.

This 440-lb unit is intended for vehicles, aircraft auxiliaries and stationary applications. Although

it is still in the pre-production stage, an earlier prototype is said

to have run for 1200 hours at the Dresden factory. ■

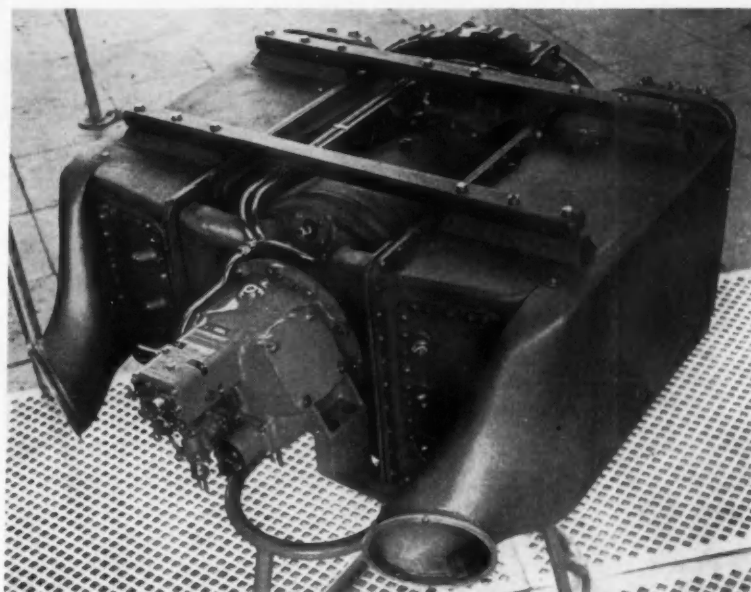
Dunlop's Spare Tire Flat as Pancake

Dunlop Tire & Rubber Corp. has announced an experimental spare tire that lies flat like a pancake less than an inch thick in the trunk of an auto until it is ready to be used.

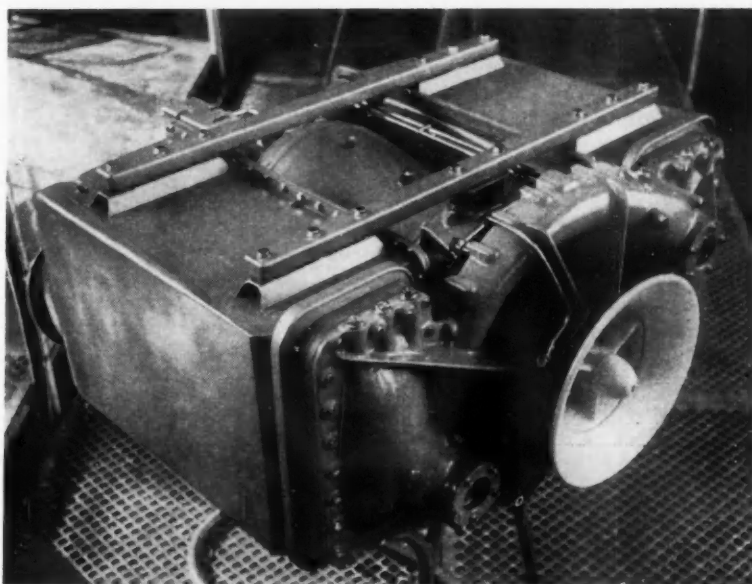
Designed for emergency use only, the narrow, tubeless tire is permanently attached to a thin steel disk drilled to match the wheel stud spacing of any auto. The spare is inflated from a flask of compressed gas that accompanies the tire.

Dunlop engineers claim tests

show the tire and disk wheel will take a driver a "considerable distance" to where he can get the regular tire repaired. They say there is only a slight difference in handling qualities of the car while the spare is attached. A spokesman said Dunlop has no immediate plans to market the new tire.



Reduction gearbox behind the turbine is flanked by ducts leading to the annular combustion chamber.



Air from the single-stage radial compressor in front divides to flow rearwards through the twin heat exchangers.

tractors and powered farm machinery.

Other Applications

The field in which oxy-acetylene welding is most widely used and accepted is in plant maintenance and repair, where its mobility and versatility result in great savings in time and labor.

The typical, small, self-contained gas welding rig can be wheeled anywhere in the plant. The same gases can be used for cutting, brazing, soldering, heat treating, surfacing and welding.

A recent survey of selected plants by a major welding equipment manufacturer has shown that from eight to 40 torches are used in the maintenance and repair of plant equipment and machinery.

Plant	Welding	Cutting
Ford Frame Div.	8	20
Mercury Assembly Div.	10	10
Dodge Truck Div.	10	15
Chevrolet Forge Div.	40	..
Dodge Main Plant	27	..

Cutting and welding torches are used by plant personnel for scrap cutting, welding and repairing loading platforms, stanchions, pipe and conduit, structures, conveyor systems, heavy machine tools and assembly line equipment and machinery. In some instances, broken edges, gear teeth and mis-machined surfaces can be welded and built-up, re-machined and heat treated to retain the properties similar to the original piece. These applications make it possible to reclaim many types of damaged parts, reducing the cost of replacements.

Additional torches are used for the fabrication of tools, dies, jigs and fixtures used in the manufacturing process. These operations are sometimes divorced from plant maintenance and placed under the jurisdiction of the tool and die shop.

* * *

This is the fifth and final part in a series of articles devoted to welding which have appeared in recent issues of *Automotive Industries*. Dates on which the first four parts appeared were:

Welding, Part I—Dec. 1, 1959, p. 43.

Welding, Part II—Feb. 1, 1960, p. 35.

Welding, Part III—March 1, 1960, p. 47.

Welding, Part IV—Apr. 1, 1960, p. 39.

NEWS OF THE MACHINERY INDUSTRIES

(Continued from page 60)

modernization programs. By reducing the information to code, it can be run through data processing machines. Thus, the military can tell the number and condition of its equipment when planning for modernization.

Around the Industry

Giddings & Lewis Machine Tool Co.—has sold its Cincinnati plant to The Cincinnati Milling Machine Co. Real estate only was involved. Manufacture of G&L/

Bickford drilling machines is being moved to Wisconsin, where G&L has enlarged machine tool plants in Fond du Lac and Kaukauna.

Norton Co.—has successfully made diamonds, according to an announcement by Milton P. Higgins, president. Applications for patents on both the process and apparatus have been filed. No commercial production is anticipated at the present time, Mr. Higgins said. ■

Patterns and Dies of Nickel Made by New Process

(Continued from page 52)

a melting point of 2600 F. Tensile strength is 85,000 to 95,000 lb; and elongation 15 to 20 per cent. It is also said to have high thermal-shock properties up to 1600 F, permitting rapid cooling or quenching without heat checking.

The finished product—pattern, mold, die, or other geometric shape—is highly resistant to abrasion. It is stated to be particularly resistant to sand abrasion—and to have about five times the sand-abrasive-resistance of cast iron, and abrasive-resistance qualities superior to those of aluminum, bronze, and chrome vanadium steel. The material also work-hardens under impact of sand from sand slingers, blowers and rammers; and becomes brighter and smoother with use.

Since the material has very fine grain structure and surface smoothness, Budd engineers say no release agent is ordinarily required with sand and sand binders.

Similarly, on forming-die applications lubricants are evidently not needed. The carbonyl nickel will not cold-weld on impact or otherwise score the sheet metal work, it is claimed.

The eutectic mold material has a coefficient of expansion identical to that of nickel. Therefore no shrink allowance, except to provide for the ultimate casting, is required by the process. Reproducibility tolerances

are said to be well within limits established in the foundry industry—from -0.005 to $+0.010$ in. total overall tolerance, with an average of ± 0.005 in.

The end nickel material is repairable by welding, brazing, silver-soldering, or lead-soldering.

SIZES

Carbonyl nickel patterns and dies can be made available in dimensions from about 1 by 1 in. up to 60 by 100 in. Company officials say there is no limit to the degree of complexity of shape or surface configuration. Further, that the more high-complicated the piece, the lower both the reproducing time and cost are apt to be as compared with conventional machining and hand-finishing techniques.

COST

As a general yardstick, the initial cost of Budd carbonyl nickel molds, patterns and dies of fairly complex shape is stated to be substantially the same as the cost of similar products made by conventional methods. Overall cost-saving advantages can come from such factors as reduced time from design to production, longer life, no need for release agents, and quality of produced parts obtained from close-tolerance reproducibility and smooth corrosion-proof surfaces. ■



New Eaton Process Cuts Costs of Alloy-Faced Valves

The new Eaton ECONOSEAT process of applying heat resistant and corrosion resistant material to valve faces makes possible a worthwhile reduction in the amount of costly protective alloys required.

If you have hesitated to use high-alloy-faced valves because of cost—or are now using valves conventionally faced and are interested in reducing costs—you will want complete information about the advantages of Eaton ECONOSEAT Valves. Eaton engineers will be glad to consult with you without obligation.



Call on Eaton engineers to discuss with you the possibilities of applying the ECONOSEAT process to parts, other than valves, requiring protective coatings.

EATON

— VALVE DIVISION —
MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Gears • Hydraulic Pumps
Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners
Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes
Powdered Metal Parts • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems

METALS

(Continued from page 72)

users will find their inventories so low that they must enter the market regardless. Wire mills, on the other hand, are more cheerful and, with the advent of warmer weather, sales show a distinct improvement. A heartening note has been an increase in the price of copper scrap which is now selling about 24½ cents a pound, equivalent to about 30 cents for refined copper produced three months hence. While the possibility of strikes at the big Chile copper mines cannot be ruled out, nor can trouble in Belgian Congo that would affect Katanga's production be overlooked, neither event is certain. Should they occur the copper price could again start upwards in spite of efforts by the producers to maintain a much desired stability.

Zinc Stocks Show Small Decline in March

The latest figures released by the Zinc Institute disclosed a substantial increase in zinc production by the smelters in March. Output rose about 11,300 tons to total over 86,000 tons for the month. It was the largest output for more than two years.

For compensation, domestic shipments held up well, reaching 80,760 tons and coupled with export drawback, brought total shipments above 86,500 tons. In consequence, stocks in hands of the smelters showed another decline at the end of the month, although somewhat less than was expected.

Lead Sales Improve Slightly

Lead sales improved a little in April but there is no sign of an upward price movement. However, the market remains firm at the 12 cent level. World production and consumption now appears to be in reasonably close balance. The leading Canadian producer raised its price ¼ cent to 11 cents to home buyers, which would bring it

slightly higher than the U. S. price after allowing for the tariff. Further gains are expected in the use of tetraethyl lead in 1960.

Aluminum Output Rises

Aluminum output started to rise

in March and the upturn in primary production is continuing into the second quarter. However, it is expected it will level off temporarily until new facilities are brought in later on. At present the primary industry is producing at about 85 per cent of capacity.

Efficient Antismog Device

(Continued from page 48)

For one thing, it has been shown by Chrysler that properly tuned engines have average emission characteristics of the same order as required by the State of California. Thus exhaust emissions for new cars should approach the minimum standards.

It was pointed out, however, that normal operation and depreciation in engine condition, together with fouled spark plugs, will result in exhaust emissions far exceeding acceptable limits. This observation is generally true of any make of car.

One answer would be to have compulsory inspection at regular intervals, perhaps twice a year. Persons whose vehicles are found to have exhaust emissions above the acceptable level would be required to have their engines serviced and reinspected. This would

be an extremely expensive and time-consuming procedure and would not be completely effective since a defective or fouled spark plug could upset the level of the emissions at any time.

Utility of the afterburner described here lies in the fact that it controls emissions within specified limits regardless of engine condition, even if a spark plug goes bad. Thus it assures corrective action. The afterburner also has the advantage of burning the crankcase blowby gases, thus obviating the need to recirculate these gases through the engine.

Finally, it is well to note that the afterburner is expected to have the same life characteristics and maintenance requirements of standard engine components. ■

Safe Driving at 170 MPH?

(Continued from page 43)

And when the subject of "crowds" comes up, we are proud that the "500" annually attracts the largest crowd ever to see a single U. S. sporting event. Estimates are as high as 200,000 on Race Day alone, temporarily making Speedway the second largest city in Indiana.

To cope with the emergencies that may arise in such a gathering, we have a Safety Patrol of 1600 blue-uniformed personnel and a staff of doctors and nurses numbering almost 100. Safety Patrolmen serve as ushers, attendants, guards, and a number of other occupations rolled into one, while the physicians and nurses spend almost

all of their time on sunburns, fainting spells, and minor illnesses common in any city of this size, rather than on track accidents.

With this sort of turnout expected, virtually every police officer in a radius of 50 miles is on duty. The Indiana Highway Patrol is also out in force, moving traffic in and out of the city with maximum speed and watching for those motorists inspired by the heavy feet of a Rodger Ward, Jimmy Bryan or Sam Hanks.

Backing up this small army of public servants is a fleet of safety vehicles—16 ambulances, 14 wreckers, and nine pieces of fire apparatus, including "crash" trucks



THOMSON RIVETS offer faster assembly ... greater strength ... improved performance

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AUTOMOTIVE INDUSTRIES, May 1, 1960

*Thomson Rivets cut costs for such products as
BRAKES, CLUTCHES, DISTRIBUTORS, SWITCHES, RADIOS,
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at each of the four turns. These latter are pick-up trucks fitted with water and foam systems and dry chemical, carbon dioxide, and vaporizing liquid extinguishers.

No mention of fire protection equipment would be complete without a credit to The Fyr-Fyter Co. for the large part it plays in the success of the "500."

Since 1935, Pyrene-C-O-Two (now a Fyr-Fyter brand) has been supplying about \$30,000-worth of hand and wheeled portable extinguishers, hose systems, powder, and foam equipment for the race . . . and at no charge. In 1959 all of the company's major extinguisher brands—Pyrene-C-O-Two, Buffalo, and Fyr-Fyter—participated, and they will again in 1960.

Although the equipment alone is a sizeable contribution, perhaps even more valuable is the assist given in manpower. Each year the company invites almost 100 fire chiefs and industrial plant safety directors—all experienced fire protection men—to serve as fire safety

crews in the pit area on Race Day.

The training program for these men is brief and to the point. It consists mainly of instruction in race procedure—where to stand when a car makes a pit stop and what to look for—along with a quick refresher course on extinguishers. This training and organization into three-man teams for each of the 33 pits is also undertaken by Fyr-Fyter.

While Race Day itself brings the biggest crowds, it is really the climax of a five-day racing program. On the two previous Saturdays and Sundays are the qualifying runs, narrowing the number of participating cars and drivers from as many as 99 to the final 33. On these four earlier days, Fyr-Fyter brings in the same number of firemen from the Indianapolis area to handle the pit extinguishers . . . two 15-lb carbon dioxide hand units and one 50-lb CO₂ engine.

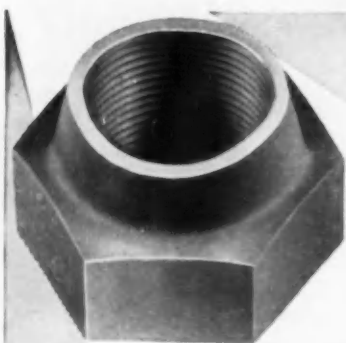
And they do get a workout! Despite all the precautions, at least one fire has broken out in the pit every year; one year there were

seven. Speed adds its own heat to the usually bright Indiana sunshine, and some parts of the cars are hot enough to ignite gasoline. Fuel for the fire can come from ruptured gas tanks, broken fuel lines, or overflows from the pressurized filling of tanks.

We have named a goodly number of hazards that the professional racer must face, and many of them hold true at other tracks. He must be a remarkable person. Many racers are family men, and yet they know the more races they enter the more they have a chance to win and that the winnings and the risks are proportionate.

Try as we might, there is no way that all the hazards can be removed and the goals of racing still retained. All we can do is remove those deemed unnecessary, cut down the others as far as possible, and stand ready to help when the danger is faced.

It is our job to see that every car able to hit 170 mph has a driver able to talk about it afterwards. ■



Three sectors of the tapered portion of the CONELOCK nut are preformed inwardly (Fig. 1). When the Nut is applied to a bolt, these conforming sectors are elastically returned to a circular configuration and create an inward and downward pressure which produces intimate contact between the load carrying flanks of the nut and bolt threads (Fig. 2). The shape of the cone sector displacement insures conformity with the mating bolt and maximum fric-

New One-Piece "Conelok" with prevailing torque

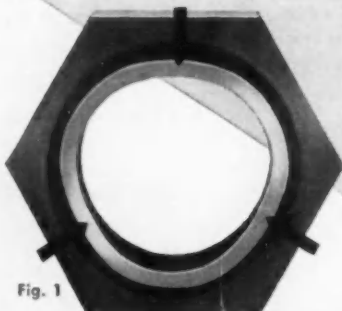


Fig. 1

tion contact area. . . . The closed stress path in the locking portion of the nut and the advantageous distribution of locking pressure, produce a locking device of high fatigue life . . . and equivalent locking force is exerted at only a fraction of the stress of any slotted type locknut. CONELOCK main-

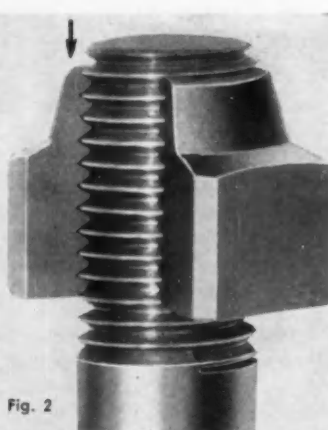


Fig. 2

tains its locking action through many re-applications. . . . It is adaptable to high, and low torque assemblies . . . to high torque stop-nut applications . . . and may be obtained in sizes from No. 10 through 1½", Full and Thick dimensions are "Standard". . .

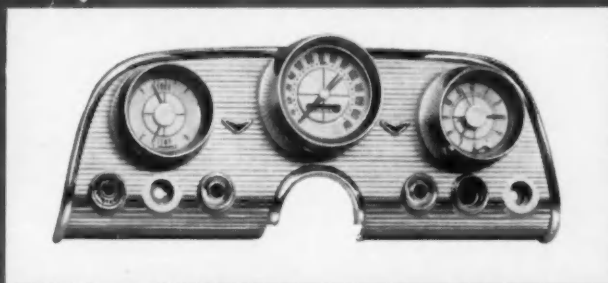
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The component specialist works with all his energy in a restricted field—striving through continuing research to approach perfection. Being both artisan and artist, he is never content to "Let Well Enough Alone." Thus, Progress is achieved.

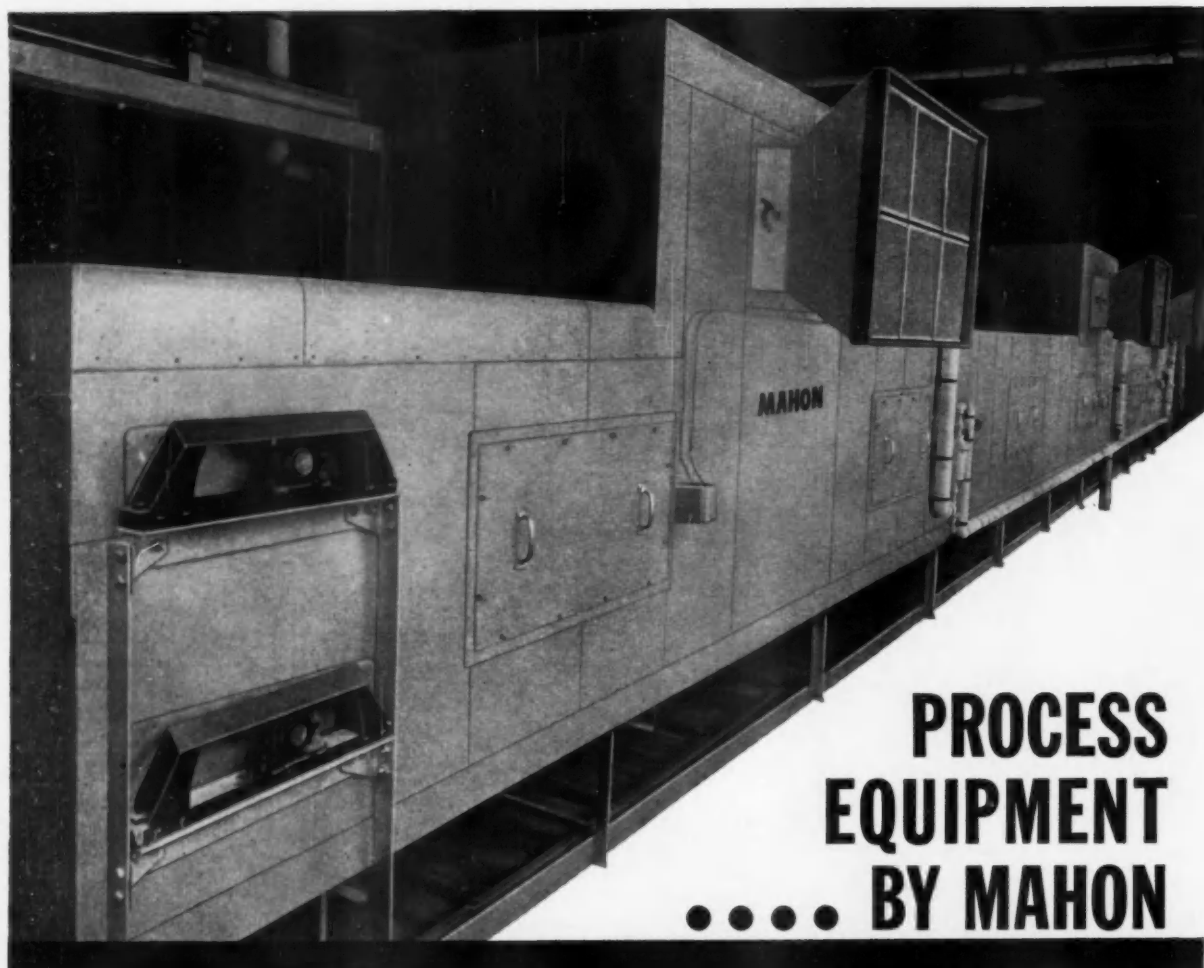
The vehicle manufacturer is vitally concerned with his end product, the vehicle—concerned with the dependable flow of production and with costs. He capitalizes on the progress achieved by the Specialist.

King-Seeley has for 40 years specialized in automotive control devices. To King-Seeley engineers is due much of the credit for the major developments in this field.

KING-SEELEY DIVISION

OF THE KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN



PROCESS EQUIPMENT ... BY MAHON

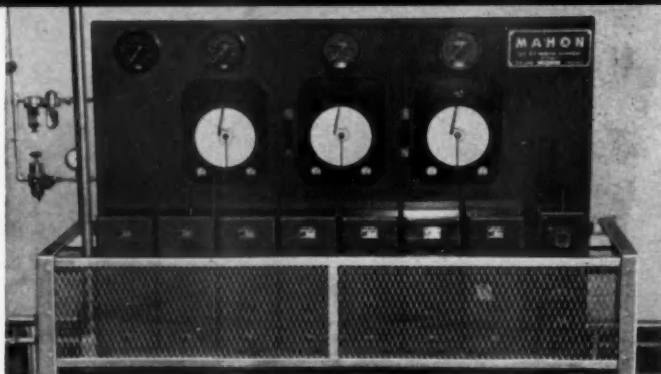
new plastic-curing oven system for GOODYEAR is double-decked for efficiency

Curing of 75-ft. long, 7-ft. wide sections of a spongy plastic material, with heating and cooling cycles rigidly controlled, is a tough processing problem. Mahon equipment does the job two-at-a-time . . . and also automates the method! This new oven system converted the operation to a smooth, continuous process.

The unusual installation (shown above) is 80-ft. long with double-decked ovens for increased capacity. Specially developed by Mahon and Goodyear engineers, the system features integrated materials handling, precisely controlled heating and rapid cooling. Curing is done at preset temperatures up to 300°F, the ovens holding the plastic sections for about eight hours. At the end of this cycle, the entire system is fast cooled, the work discharged and the ovens brought back up to heat—all automatically.

If you are considering new or improved process equipment call in a Mahon engineer . . . their assistance could prove invaluable.

Manufacturing Plants—Detroit, Mich. and Los Angeles, Calif.
Sales-Engineering Offices in Detroit, New York,
Chicago, Los Angeles and San Francisco
Representatives in all principal cities



Special oven control panel, designed by Mahon for the Goodyear Tire and Rubber Co., monitors the entire eight-hour curing cycle for the plastic material.

Write for Descriptive Catalog A-660 on the scope of Mahon Industrial Equipment for metal finishing, cleaning, painting, heating, heat treating, etc. Also in Sweet's Plant Engineering File.

THE R. C. MAHON COMPANY

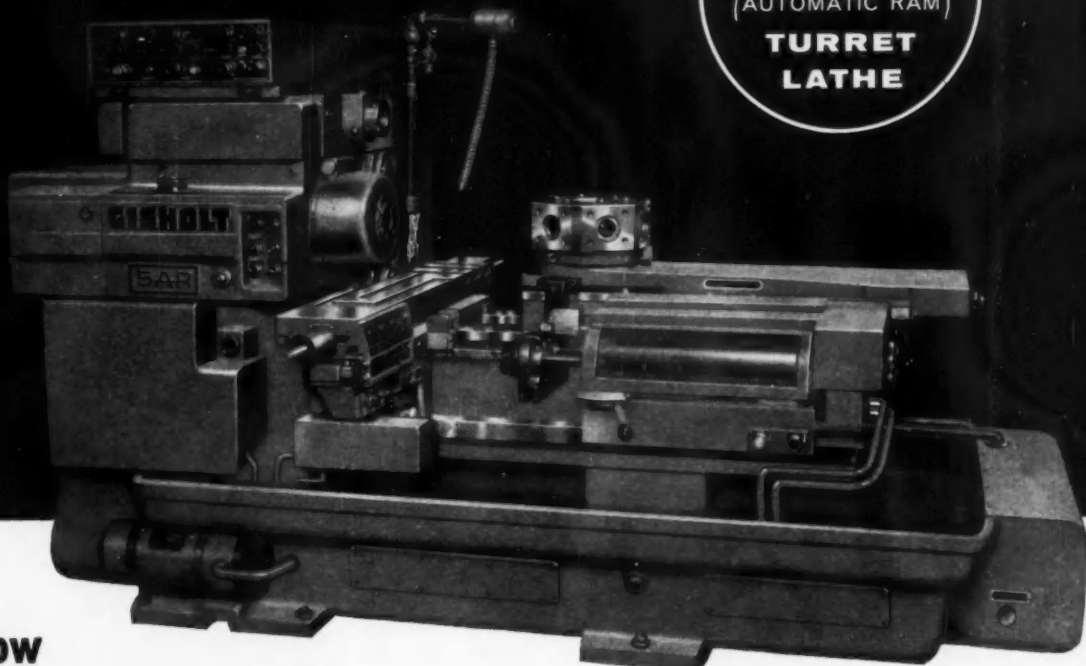
Detroit 34, Michigan

YOUR BIGGEST VALUE is in MAHON'S
planning and engineering EXPERIENCE

MAHON

ANNOUNCING

the new **GISHOLT**



Now

one machine does both bar and chucking work...automatically

Here is a ram-type turret lathe "gone automatic." It's the new Gisholt MASTERLINE AR. It handles both bar and chucking work. Changeover takes less than 1 hour. But that's not all. It combines the efficiency and consistent production of an automatic with fast setup and versatility. Yet, the new AR costs very little more than a hand-operated turret lathe!

For long runs or small lots. Whether you are now using automatics for long runs, or standard ram-type turret lathes for small lots, you'll want to evaluate this new development in automatics. You will quickly see how the new AR will cut your costs. Based on productivity, capacity, versatility, dependability, ease of operation, setup speed and original cost,

you'll find it's a new best buy for your equipment dollar today!

Ask for desk-side demonstration. Your Gisholt Representative will gladly explain the cost-cutting features of the new AR and show you how it can boost profits for you. Ask for your personal, desk-side demonstration or write for literature.



GISHOLT
MACHINE COMPANY

Investigate Gisholt's Extended
Payment and Leasing Plans

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers •
Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

SAE Aeronautic Meeting

(Continued from page 41)

The electron gun and workpiece are enclosed in a vacuum-tight chamber.

During the welding, a pressure of less than about 1 micron must be maintained. By welding at this low pressure, weld-metal contamination is virtually eliminated.

The range of metals that have been welded by this process includes steels (stainless and ultra-

high-strength), refractory metals such as tungsten and molybdenum, titanium and beryllium. Fuel elements clad with aluminum, Zircaloy-2 and stainless steels have also been fabricated with this technique.

Electron beam welding is particularly applicable to the production of subminiature components and sealing any parts requiring no internal gas.

Fuel Cells—A Technical and Economic Study

By Anthony M. Moos

Vice President and General Manager

PATTERSON MOOS RESEARCH

Division of Leeson Corporation

THE fuel cell is a powerplant system in the traditional sense in that it consumes fuel, combines the fuel with an oxidant, and converts the resultant energy of combustion into a useful form of electrical power. It is unique in that it performs the conversion from chemical to electrical energy with twice the efficiency of the most efficient powerplants available today.

Most of the reported fuel cell work done to date uses hydrogen or mixtures of hydrogen and a hydrocarbon as the fuel and oxygen as the oxidizer.

Generally, any anodic reactant in a battery can be considered as a fuel. In a fuel cell the electrode reactants are not stored in appreciable amounts within the electrochemical energy converter (battery), but are fed into the system in a continuous fashion.

All fuel cells contain certain elements separate or in combination: two electrodes, one positive and one negative; an electrolyte which is the ionic connecting medium between the two electrodes; a fuel and an oxidant. Catalysts in the electrode system or the electrolyte are used to promote the reaction between these components.

Technical feasibility has been shown in the following systems:

1. Low temperature (50 to 150 F), low pressure (1 to 50 psi) hydrogen-oxygen or air fuel cells.

2. Medium temperature (400-600 F) and high pressure (400 to 1000 psi) hydrogen-oxygen fuel cells.

3. Low temperature fuel cells using hydrocarbon fuels and oxygen.

4. High temperature (400 to 1000 F) fuel cells using hydrocarbons and air. These cells generally operate at relatively low pressures and use fused salts as electrolytes.

Production Application of High Energy Rate

By E. W. Feddersen

Chief of Manufacturing

RESEARCH & DEVELOPMENT

Convair, Div. General Dynamics Corp.

THE high energy rate process is commonly described as a "means of shaping metals with a sudden exertion of pressures from an explosive charge."

Three major methods of applying high energy rate to the deformation of materials are explosive, hydro-electric and pneumatic-mechanical.

Explosive Forming—is the shaping of materials by the exertion of sudden pressures from the explosion of a chemical charge. The shock wave and subsequent hydraulic action cause the material to take the shape of its die. Normally, a medium such as water is used to transmit these forces because the intense heat generated tends to burn the material. Water is also used because a more uniform pressure is experienced from the hydraulic action.

Although explosive forming cannot compete with mechanical means for high volume items, it does have the ability to form and size large, complex sections at fractional tool costs and eliminate large mechanical machinery.

Hydro-Electric Forming—is described as underwater lightning. Electrical energy is stored in capacitors and suddenly triggered. The energy, applied through a water medium, is the same as in explosive forming. The process is accurate and repeatable and, because of complete controllability, is usable within a fully inhabited factory. ■

BOOKS...

WHAT EVERY SUPERVISOR SHOULD KNOW, by Lester R. Bittel, published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price, \$7.95. How to handle major supervisory problems is the theme of this handy guidebook. Through the question-and-answer technique, the author tells the supervisor what he needs to know about industrial operations and about understanding and dealing with people. Supplementing the questions and answers are helpful case histories, charts, and cartoons. Among the subjects covered: human, employee, public and community relations; the fundamentals of supervising people; special techniques for handling employees; organization and management of the supervisor's job; and general aids to success.

THE DIESEL ENGINE, by L. V. Armstrong and J. B. Hartman, published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. Price, \$8.75. This book covers the theory, basic design, and economics of the Diesel engine. It examines the effects of combustion upon the moving parts of the engine and then on the static and restraining parts. Also included is a treatment of "parasitic engine parts" as well as a mathematical explanation of the workings of a dual-fuel and a gas-Diesel engine.

ACRYLIC RESINS, by Milton B. Horn, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. The four types of acrylics are described in respect to their manufacture, fabrication and applications. These types include cast products, molding compounds, emulsion and solution compounds. Chemists, sales personnel and executives have a complete guide on every aspect of acrylics.



Memo to a Man of "Parts"

The number of different parts made from Roebling High Carbon Specialties, Flat Wire and Spring Steel are close to countless.

Some things you can count on, though, are the consistent dimensional and mechanical uniformity you get with any Roebling High Carbon Specialty. They are the qualities that contribute to speeding *your* production and cutting *your* costs.

They are high qualities that make for high values. Next time you need flat wire or spring steel, specify Roebling. For information, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, N. J.

ROEBLING 

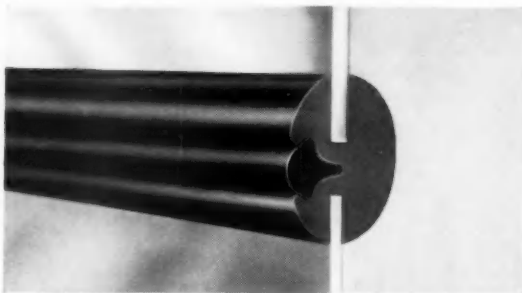
Branch Offices in Principal Cities
John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

Roebling... Your Product is Better for it



custom designed and 7 ways best

*Specify Inland Self-Sealing Weatherstrip
for lowest cost, perfect weatherproofing of
fixed windows*



Like an original gown, Inland Self-Sealing Weatherstrip is specially designed—solves your weatherproofing problems best in seven ways

1. **Each application** custom designed . . . to your prints or using our standard sections.
2. **Basic seal design** increases pressure to stop leaks.
3. **Filler strip** makes job absolutely leakproof, eliminates special moldings, channels, binders or cement.
4. **Special compounding** maintains sealing pressure, long life.
5. **Design costs** are reduced; design freedom is increased.
6. **One-man installation** in minutes reduces assembly costs.
7. **Replacement** is fast and easy.

The result? Inland Self-Sealing Weatherstrip is the best your money can buy for complete customer satisfaction for any type of fixed window installation.

Write, wire, or phone today about your weatherproofing problems. Catalog on request.



INLAND SELF-SEALING WEATHER STRIP

Inland Manufacturing Division
General Motors Corporation • Dayton, Ohio



Transportation Industry



Railway Equipment



Off-the-road Equipment



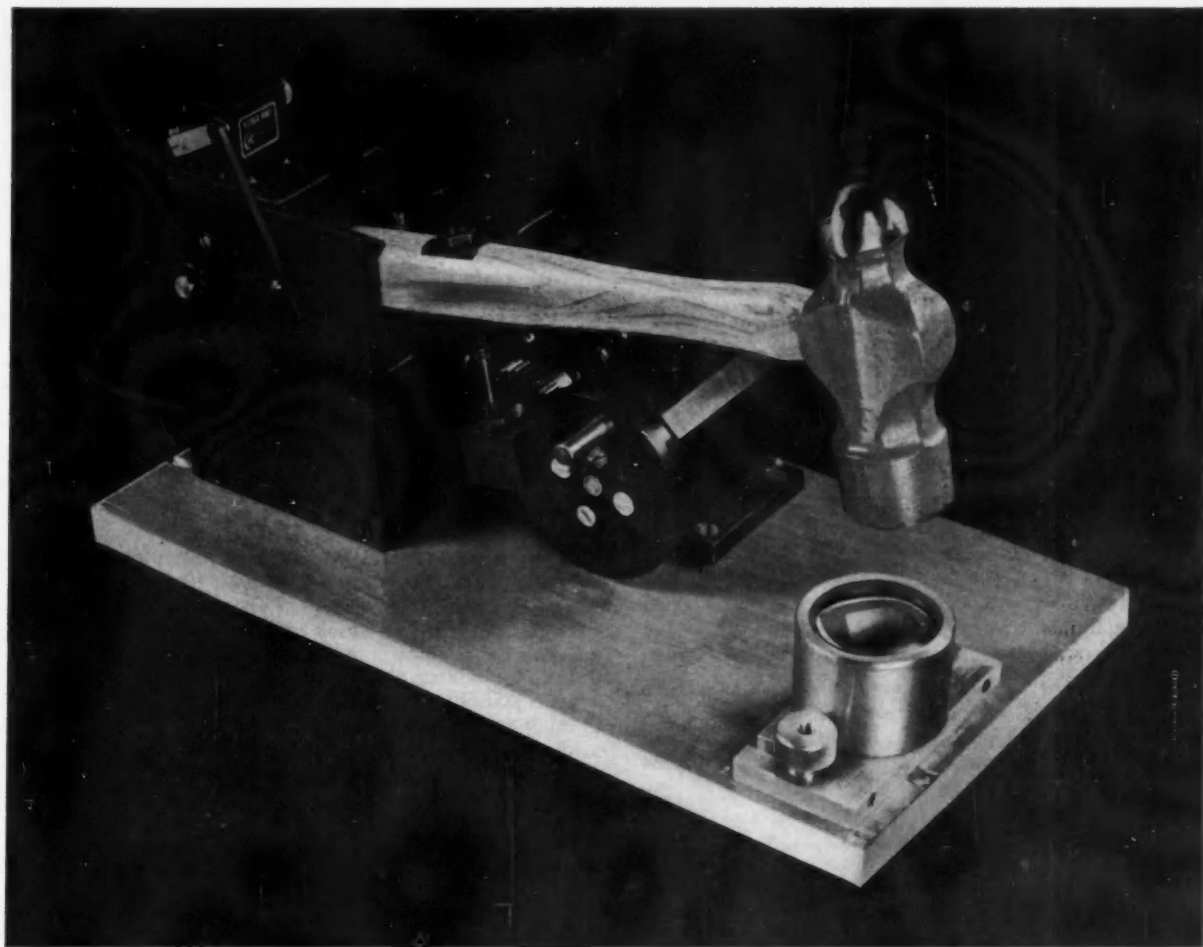
Appliances



Marine Applications



Commercial Structures



381,198 blows prove Bal-SAFE lens protection

Here is dramatic proof of the extra margin of safety your workers get when their eyes are protected with Bal-SAFE impact resistant lenses—regular or prescription ground to personal vision needs.

Each blow of this 2-lb. steel hammer struck the polished surface of a regular industrial thickness (3mm) Bal-SAFE lens with a force of .87 foot pounds. The lens, supported only around its edge by a hard rubber ring, resisted days of continuous hammering at the rate of 22 blows per minute. Not until the 381,198th blow did it finally shatter.

Through an exclusive toughening process, Bal-SAFE lenses average a minimum of 6 times the impact resistance required by the U.S. Bureau of Standards. Each lens undergoes a special large-orifice quenching operation that uses big amounts of air at carefully controlled

temperatures. The entire lens surface gets the blast at once. The process is the same whether for prescription safety lenses finished locally at your B&L laboratory, or for plain safety lenses finished at the B&L factory.

Held securely in extra strong B&L Safety Frames, Bal-SAFE lenses provide the utmost in eye protection, visual efficiency, and worker comfort. Want to know more about them? Call your B&L supplier, or drop a line to: Bausch & Lomb, 98605 Lomb Park, Rochester 2, N. Y.

BAUSCH & LOMB



**Protection PLUS
Safety Products**

protection + economy + worker acceptance

GENEVA SALON

continued from page 36

a coupe on the 2100 Fiat which is fair, but not what we in the States would expect from an Italian body builder.

Bertone is also involved in a new venture which is an English-Italian-American collaboration. English, as far as the driving force behind this venture is concerned, a Mr. Gordon who was one of the directors in the English Company, Peereless. American, the power-plant, a Corvette-V8. The car which bears the name Gordon is a very beautiful, sporty, 4 passenger coupe (Grand turismo). This is a new attempt aimed at the American market similar to the attempts made by Allard, Facel-Vega, Dual-Ghia, to use an American motor in a foreign chassis and body. I don't believe that any of these companies were particularly successful in the States. I dare say that in my belief the Gordon has a very good chance. The estimated price is around \$6000.—P.O.E.

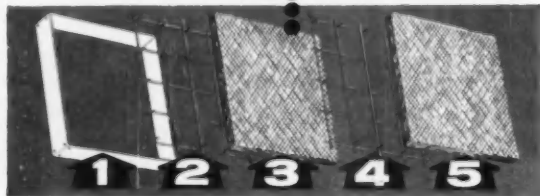
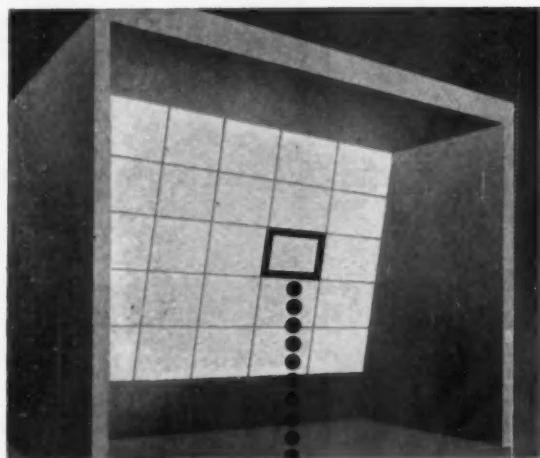
Farina showed in addition to their known models, a Cadillac Starlight II which was previously shown in Paris, a super sport Alfa-Romeo 3500. He told me that he had started limited production on this model and that it would be shown in the States shortly.

Beutler, a Swiss body builder, showed a 4 passenger Porsche which is, as far as the roominess is con-

cerned, what a lot of people would like from a Porsche, but stylewise though a lot of Porsche parts were used, just not what one expects a Porsche to be. Chapron (France) showed convertibles and hardtop on Citroën. Russia was represented by the Moskvich and Tschaiika-Wolga. The Moskvich would appear very reminiscent of an old Packard. For the time being I don't believe we have to fear anything stylewise in the automotive field which comes out of Russia. ■

Stewart-Warner's Record Earnings

All-time sales and earnings record were set in 1959 by Stewart-Warner Corp. Sales totaled \$114 million, a 25 per cent gain over 1958. Net income was \$7.8 million or \$2.40 a share after adjustment for the two-for-one stock split effective last Dec. 22. S-W's net income last year was 53 per cent greater than in 1958 and was 19 per cent more than 1956, best previous year. Sales of original equipment items to passenger auto manufacturers accounted for 9 1/2 per cent of total dollar volume and sales to truck manufacturers were about 7 1/2 per cent of volume. The company's sales to automotive makers last year were 64 per cent higher than in 1958.



A Paint Arrestor module consists of a Holding Frame (1), two Snap-in Grids (2 and 4), two Paint Arrestors (3 and 5). Loaded Paint Arrestors are simply replaced as necessary. And, they're also ideal for air-borne ink, mist, dye, frit, etc.

CONTROL PAINT OVERSPRAY the inexpensive, effective way!

The advantages of R P Paint Arrestors, the inexpensive, disposable air filters are many. Overspray solids are trapped before they reach the exhaust stack... to reduce fire hazards, damage to adjacent property... disagreeable and time-consuming maintenance work. Installation? —easy and fast. Maintenance? —remove loaded Paint Arrestor and replace a new one. Adaptability? —ideal for any type, any size booth, new or existing.

RP PAINT ARRESTORS



Products of Research



RESEARCH PRODUCTS Corporation

Dept. 310, MADISON 1, WISCONSIN



KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Normalizing Alloy Steels

There are several forms of heat-treatment commonly employed in the processing of alloy steels. Each in its own way modifies the mechanical properties and structures of steel, and each is chosen with a definite objective in mind. The five usual forms of treatment are normalizing, annealing, spheroidize-annealing, quenching and tempering, and stress-relieving.

In this particular discussion, let us consider briefly the purposes and effects of normalizing.

Normalizing is an operation in which the steel is heated to approximately 100 deg F above the upper transformation range, then cooled in still or agitated air. The basic purpose is to refine the prior structure produced by variations in finishing temperatures encountered in rolling or forging. The structure resulting from normalizing, being more uniform, will help create improved mechanical properties when the steel is subsequently reheated, liquid-quenched, and tempered.

There are times when large steel parts (heavy forgings, for example) cannot be liquid-quenched because of their size. In cases of this nature, the heat-treatment must consist of single or multiple normalizing followed by tempering.

High-temperature normalizing is sometimes used for grain-coarsening

low-carbon alloy steels to promote machinability. (In high-temperature normalizing, steel is heated to more than 100 deg F above the upper transformation range.) At times it is possible to machine a steel in the air-cooled condition, the governing factor being the alloy content. However, the highly alloyed analyses may require annealing or tempering after normalizing, to decrease the hardness.

It is essential, when normalizing is employed, that free circulation of still or agitated air be provided. When air-cooling of individual bars or forgings is not practicable, the furnace charge should provide for some means of separation, such as racks or spacers.

If you would care to know more about normalizing, or any other phase of heat-treating, you are invited to consult with Bethlehem metallurgists. They are always glad to give you any help you need.

And remember that Bethlehem makes the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades.

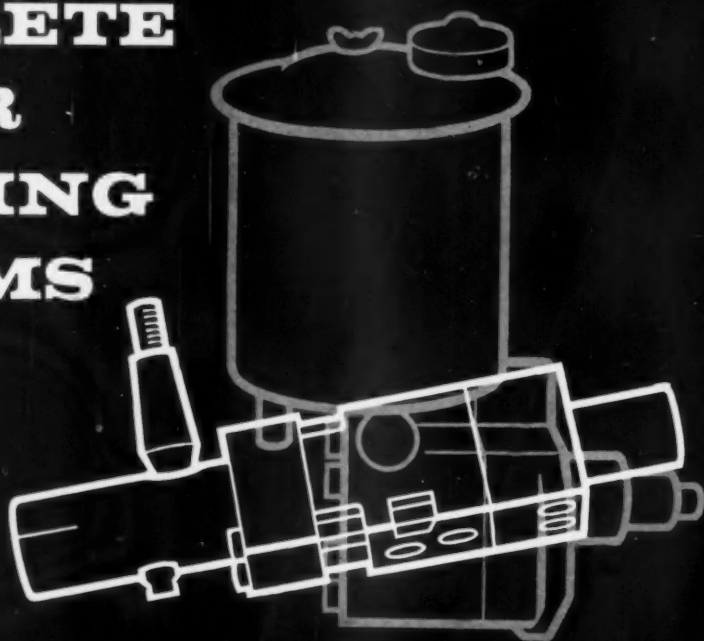
This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



ONLY **VICKERS** OFFERS NEW AND COMPLETE POWER STEERING SYSTEMS



Complete System Responsibility

VANE PUMPS FOR BEST OPERATION

The Vickers power steering system utilizes vane pumps designed and built to last much longer than other type pumps. Further, they exert virtually no load on the starter like gear pumps do on those cold morning starts.

WORLDWIDE STOCKS AND INTERCHANGEABILITY

If part of your production goes into export, or if you manufacture abroad, consider this: Vickers products are built in plants throughout the free world . . . and all parts from all plants are completely interchangeable. Wherever your equipment is working, there are Vickers parts nearby.

FOR ALL THE DATA . . .



New bulletin gives complete information on this important breakthrough in power steering design and manufacture. It contains dimensions, ratings and other data so you can draw your own comparisons. Write for Bulletin M5110.

For axle loadings from 1,500 lbs. to 128,000 lbs.

Manufacturers of mobile equipment can now install a completely tailor-made power steering system using standard, production built components. These components are designed to occupy less space because of compact design and high pressure operation (up to 2000 psi). Size for size you get double the thrust for equivalent price.

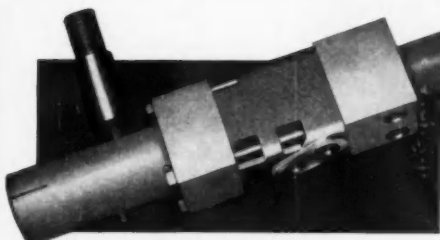
There are other advantages, too. Your engineering and manufacturing costs are substantially reduced since for all vehicle models you have a matching standard system. Your inventory is reduced because fewer parts are

needed and all parts are interchangeable... field service is simplified, speeded, too. These parts are all of the same well-engineered construction providing uniform performance and service.

All cylinders are double walled eliminating functional damage to cylinder walls by flying debris, a common hazard.

In addition, when you deal with Vickers you are dealing with a pioneer in power steering... a company that maintains a staff of specialists in power steering to serve you. AND, you get the *complete* system from one source... Vickers, the name that *makes* the news in fluid power.

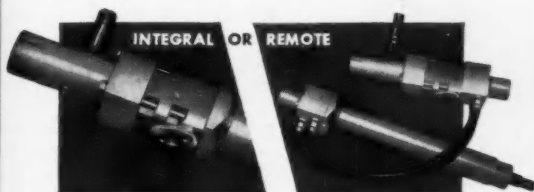
FOR ANY VEHICLE HERE'S HOW SIMPLE IT IS



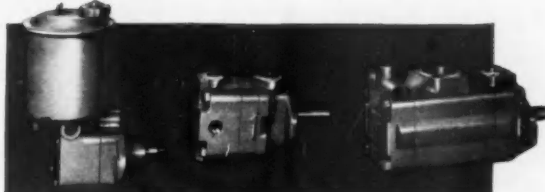
1. You take this **ONE** valve



2. One of **FOUR** cylinders



3. Connect them like this



4. Add one of three pumps

and you have **TAILOR-MADE** **VICKERS®**
POWER STEERING with **STANDARD**
PRODUCTION-BUILT COMPONENTS

8182

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

Mobile Hydraulics Division

ADMINISTRATIVE and ENGINEERING CENTER

Department 1428 • Detroit 32, Michigan

Application Engineering Offices: • ATLANTA • CHICAGO • CLEVELAND
DETROIT • HOUSTON • LOS ANGELES AREA (El Segundo)
MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) • PORTLAND, ORE.
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ALSO SOLD AND SERVICED IN AUSTRALIA, ENGLAND, GERMANY & JAPAN
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto, Montreal & Vancouver

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

WHY

Microhoning* Transmission Gears Simplifies & Improves Production

Improved product performance and simplified processing — two major factors that are accelerating the swing to Microhoning. Typical of this swing is a major manufacturer of regular and compact automobiles. In the processing of gears for automatic transmissions, this company selected Microhoning for a number of flat surfaces, bores and O.D. of a housing hub—HERE'S WHY!

SIMPLIFIES PROCESSING

Double surface Microflat machines simultaneously Microhone both flat surfaces of pinion and sun gears—first, to obtain proper thickness and parallelism on soft gear blanks. This simplifies subsequent operations (boring, hobbing, chamfering, etc.) by eliminating former orienting of gears to a single finished surface.

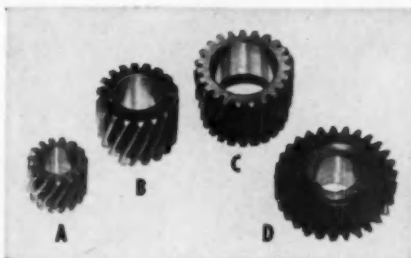
The second Microhoning of these flat surfaces, after heat-treating to 59 R "C", quickly removes all burrs and generates final accuracies and surface finish.

EFFICIENT PRODUCTION

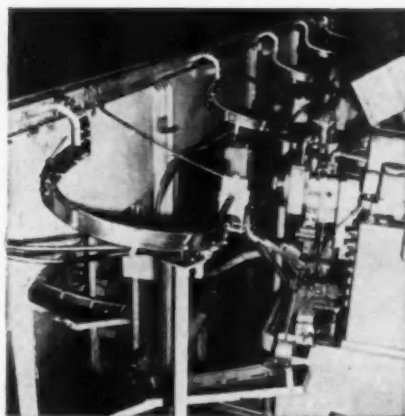
After the second flat-Microhoning operation, gears are conveyed to Microhoners for processing the bores. Typical, of the production efficiency realized on all gear bores, is the bore-Microhoning of pinion gears (nine are used in each large transmission).

On eight Microhoners these pinion gears are automatically loaded, positioned, bores Microhoned, checked for size, segregated and ejected (see photo to right). This wholly automatic sequence takes about 18 seconds per gear. Only one set up man is required to keep all eight machines in operation.

An average of .002" stock is removed from each bore; generated surface finish is 10 microinches, rms; roundness and straightness are held within .0001" tolerance;



"A"—pinion gear for large transmission
"B", "C" & "D"—pinion and sun gears for compact car transmission



diameter within .0003". Comparable results are obtained on other gear bores (see facing page).

This efficient precision production assures consistent results. Also, reliable precision on component parts is a prime answer to "Why" better performing automatic transmissions are obtained.

*Registered U.S. Pat. Off.

Scheduling

Farm Tractor Production at Allis-Chalmers

(Continued from page 58)

To supply the user with all the special features desired, Allis-Chalmers about 10 months ago set up a new system of production controls for the tractor assembly lines, using IBM office equipment to enter and forward to the assembly line the features specified by the customer. Several devices were added to the production line for the physical handling of the special parts up to assembly.

The first step was to systematize the features available. There were four basic tractors—the D-10, D-12, D-14, and D-17. Starting with the selection of the size, as represented by the basic tractor, all of the features were grouped into 16 categories, each with one or more options. A few of these are:

1. Base tractor, stripped-down model (four options).
2. Power steering or standard steering.
3. Type of front end—dual wheel, single, roll shift adjustable axle.
4. Engines for any of four fuels—gasoline, low grade fuel, Diesel, L.P. gas.
5. Special tires — three makes, nine types.
6. Hydraulic equipment—10 options.
7. Standard or heavy duty front end—for use with certain attachments, such as the front end loader.
8. Belt pulley for power take-off.
9. Shuttle clutch (forward and reverse without shifting).
10. Fender choices, four options.
11. Clutch, standard or heavy duty.
12. Foot accelerator or hand throttle.
13. Standard or low clearance muffler.
14. Operation meters.
15. Battery or magneto.
16. Signals — horn, warning lights, flasher (three options).

In setting up the production schedule the original order, typed manually at the branch office where it originated, goes into the order department and all prices and other information are checked. It then goes to the plant office, where all information is key punched onto a master record card in an IBM 024 machine. The master record card is passed through an 056 verifier, and then is fed into a 407 accounting machine. The output of this last machine is a tractor serial (Turn to page 96, please)



MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN



Reduction in spending for so-called ABC (primary, secondary, urban) roads is being proposed by the Eisenhower Administration. It wants to cut the annual appropriation from the present \$925 million a year to \$900 million. It also proposes to take the \$36 million spent annually for forest and public domain highways from the highway trust fund instead of from the general government funds as is now done.

The government's hoard of machine tools in storage continues to rise. In theory, they will be moved into production in time of war. But there is a growing doubt among military planners that many will ever be used. Meanwhile, this potential threat to the tool market (9700 tools by 1962) hangs over the industry's head.

Government housing experts aren't joining in the round of gloomy forecasts on the home building outlook for this year. In spite of slow home-building activity early this year, they still predict that gradually easing money and credit conditions will bring a building spurt in late spring and summer.

Space experts plan to fire the first 1.5 million lb. thrust rocket next year. The Saturn project will be the first stage of an eventual huge, three- or four-stage rocket. The final version, with a still-to-be-developed third stage, won't be ready for firing until 1968. The test firings next year will be with dummy upper stages.

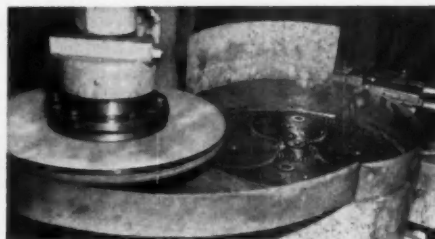
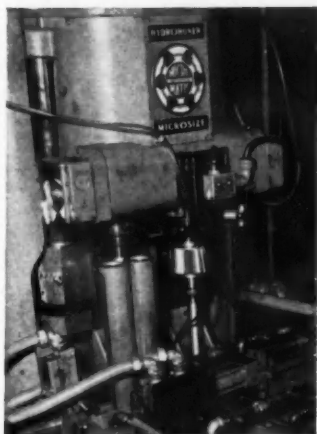
War could bring terrifying efficiency to Washington. Instead of the approximately 2.5 million Federal workers now employed, about 4,000 could actually do this job, it has been estimated. The figures came to light in a Congressional look at White House plans for running the government at remote locations in time of war or emergency.

AUTOMOTIVE INDUSTRIES, May 1, 1960

HOW

Microhoning* Transmission Gears Simplifies & Improves Production

A major manufacturer of regular and compact cars has selected Microhoning as the most efficient method for securing consistent precision, controlled surface finishes, and simplified processing. Microhoning is used on the flat surfaces and bores of a number of transmission gears plus the O.D. of a housing hub. HERE'S HOW!



Flat-Microhoning small transmission gears—head is swung to left for easy loading.

◀ Bore-Microhoning—both spindles fed simultaneously.

FLAT-MICROHONING

Both faces of a variety of transmission gears are simultaneously Microhoned. First, soft gear blanks are flat-Microhoned to secure proper thickness and parallelism within .0003", and a finish of 30 microinches (rms) or better. This simplifies subsequent processing by eliminating formerly required orienting of part to only one finished face.

The second flat-Microhoning of faces, after heat-treating to 59 R "C", quickly cleans up all burrs while generating final accuracies and finishes.

BORE-MICROHONING

The Microhoning of bores for large transmissions is described on facing page. The smaller transmission uses pinion and sun gears having various bore sizes (.697"D. x 3/4"L., .697"D. x 1-3/32"L., 1.030"D. x 7/8"L.).

To generate roundness, straightness, size and surface finish, these bores are processed on double-spindle Microhonors equipped with shuttle-type fixturing. Straightness and roundness are held within a .0003" tolerance, diametric size within .0005". All gear bores are processed in an average 26-second cycle that includes loading, Microhoning and ejection.

O.D.-MICROHONING

The converter housing hub of the large transmission is also Microhoned. Hub O.D. is 1.936", length is about 2", and it has a blind end with 1/4" relief. Two progressive Microhoning operations remove a total of about .004" stock to generate a surface finish of 15 microinches in a cycle time of 45 seconds per part. Special Microhoning technique generates circumferential lay on hub O.D. to provide compatibility between it and oil seal rotation. This increases seal life and effectiveness.

*Registered U.S. Pat. Off.



MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Circle 137 on Inquiry Card for more data

95

card and, totaling all the cards, a daily building schedule. All orders are scheduled within three days of receipt at the plant.

Both the tractor serial card and the daily building schedule go to the assembly line, and duplicates go to the shipping department also. Both cards contain all information about optional features, in addition to the serial numbers of tractor and engine, order number, branch in which the order originated, shipping instructions, and all building options. These cards are in clear—

not punch coded—so that they can be read by the men on the assembly line or on the shipping floor. Certain additional information is punched into them for later use in the office machines. The tractors move directly from the assembly line, on which all testing has been done, to the loading area for shipment.

Assembly of the tractors now takes place on three lines. On the D-17 line a slat conveyor carries the assembly along, parallel to an overhead conveyor on which are

carried all such subassemblies as torque housings, front supports, hydraulic pumps, and final drives. The overhead conveyor carrying the subassemblies moves three times as fast as the main assembly line, so that it is not necessary to have parts in the exact order in which they will be used. Workmen on the assembly line needing a certain subassembly can wait until that needed unit comes by. The time is never more than a few minutes, and other work can be done during this time. Other items come to the assembly line in tote boxes, racks, or other holders.

As the tractors use Diesel engines from the A-C Harvey Works in addition to two types of locally built engines, the engine line, consisting of an overhead monorail, has three monorails feeding into it. The engines are moved along the rail by hand, and in a predetermined order. Each engine, as it is required in the assembly line, is lowered to the line by a zip hoist.

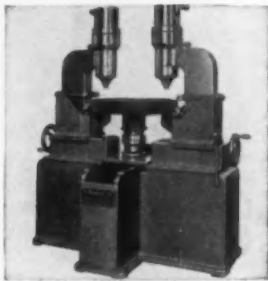
Company officials have estimated that the D-17 tractor assembly line could turn out 30 tractors a day for three months without completely duplicating any one tractor. At the same time, the volume of work will not support the elaborate systems used in the automobile industry. The system of production scheduling now used is adequate, but is capable of greater mechanization, while the actual handling of the parts on the assembly line gives all the flexibility needed to produce the variety of tractors without necessitating the exact coordination of movement of all items as used in automobile assembly plants. ■

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BOOKS...

DYNAMIC INSTABILITY, by Y. Ro-card, published by Frederick Ungar Publishing Company, New York. Price, \$9.50. This book discusses complex problems of stability as applied to road, rail, air transportation and suspension bridges. Among the subjects covered are: simple harmonic oscillations, conservative systems with two or more degrees of freedom, elementary examples of unstable mechanical systems with two degrees of freedom, directional stability of automobiles, instability of suspension bridges under wind, longitudinal stability of aircraft and critical speeds of aircraft wings. Altogether an excellent introduction to the subject for civil engineers as well as post graduate students, teachers, engineering and research institutes and designers.

AUTOMOTIVE INDUSTRIES, May 1, 1960

Manufacturers' News

Du Pont Sets Sales Record

Sales of E. I. du Pont de Nemours and Co. Inc advanced 16 per cent over 1958 and set a company record of \$2,114 million. The previous record was \$1,965 million in 1957. Earnings, after taxes, were \$8.92 a share compared with \$7.25 for 1958. This included \$2.54 from General Motors dividends each year. Earnings from du Pont sources after taxes were \$6.38 a share, exceeded only by the record \$6.51 in 1955. The 1958 earnings per share was \$4.71. The company spent \$174 million in 1959 to improve and expand plant operations and for new construction compared to a record high of \$231 million in 1958. Construction expenditures in 1960 will approximate \$220 million. Research and development of new processes in 1959 cost \$90 million, the same as in 1958. Additional facilities this year include a neoprene synthetic rubber plant near Londonderry, Northern Ireland; an orlon fiber plant at Dordrecht, The Netherlands, and a new finishes plant at Malines, Belgium.

Midland-Ross Earnings, Net Rise

Net earnings of Midland-Ross Corp. rose to \$3.9 million last year, or \$4.71 a share, compared with \$3 million or \$3.29 a share in 1958. Net sales in 1959 were \$88 million compared with \$76.3 million in the previous year. Acquisition of the Surface Combustion Corp., shareholders were told, further diversifies M-R's products. The automotive industry now accounts for less than 40 per cent of M-R sales.



Salesmen of the J. O. Ross Engineering Div., Midland-Ross Corp., hold annual sales meeting at Skytop Lodge, in Pennsylvania's Pocono Mountains.

Lockheed Sales Exceed Billion

Lockheed Aircraft Corp. has reported all-time record sales of \$1.3 billion in 1959, a gain of 33 per cent over the previous high of \$973 million in 1958. Net earnings were \$8.7 million, or \$1.24 a share, compared with \$18.8 million or \$2.92 a share in 1958. For the first time in history, Chairman Robert E. Gross reported, airplane manufacturing represented less than half the company's dollar volume. Mr. Gross explained the lowered net was caused by the excess of costs over selling prices for commercial planes. The excess costs, after income taxes, amounted to \$16 million. Mr. Gross also pointed out that missile, spacecraft and satellite sales amounted to \$512.2 million, a gain of \$210 million over 1958.

AUTOMOTIVE INDUSTRIES, May 1, 1960

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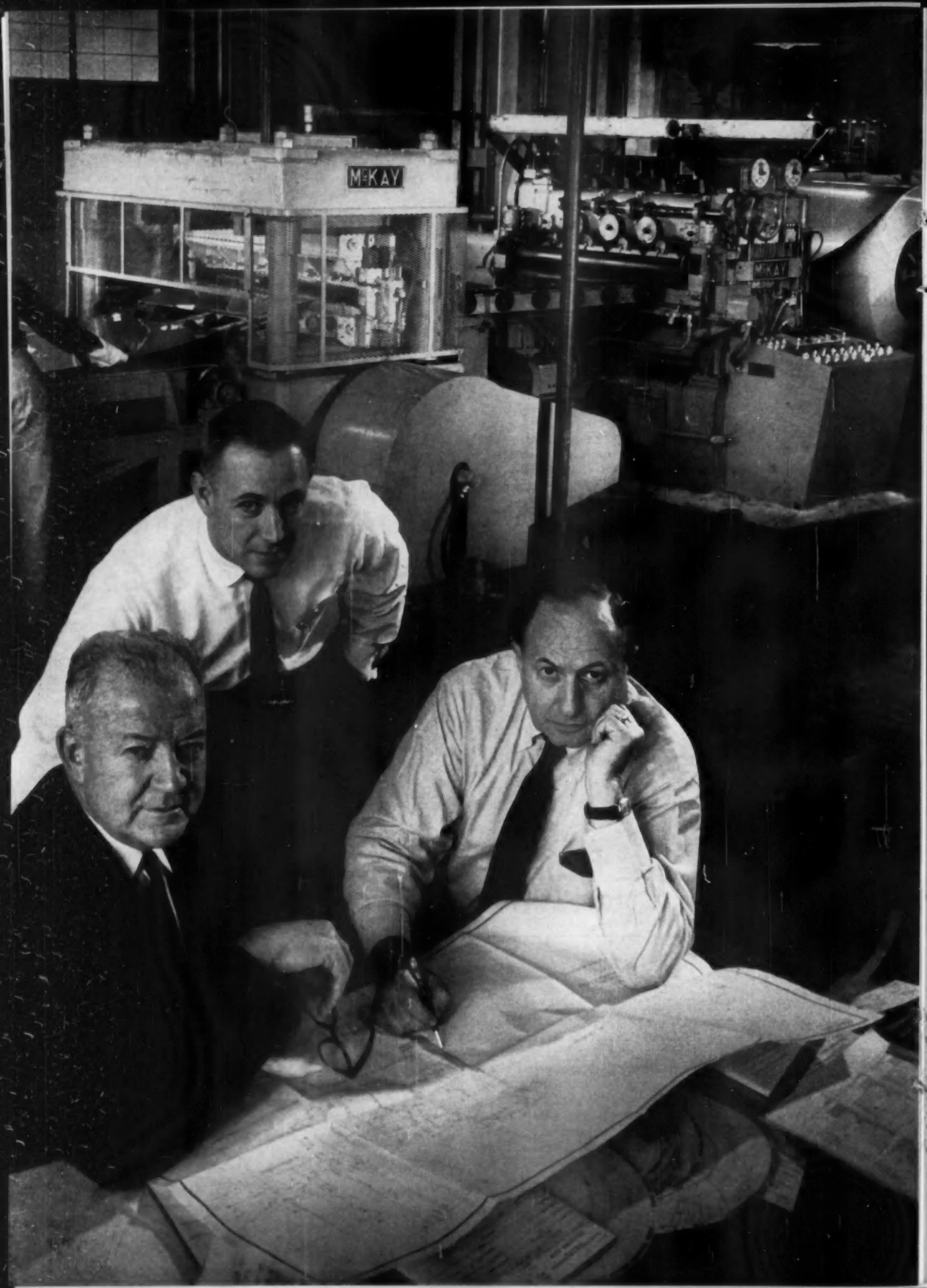


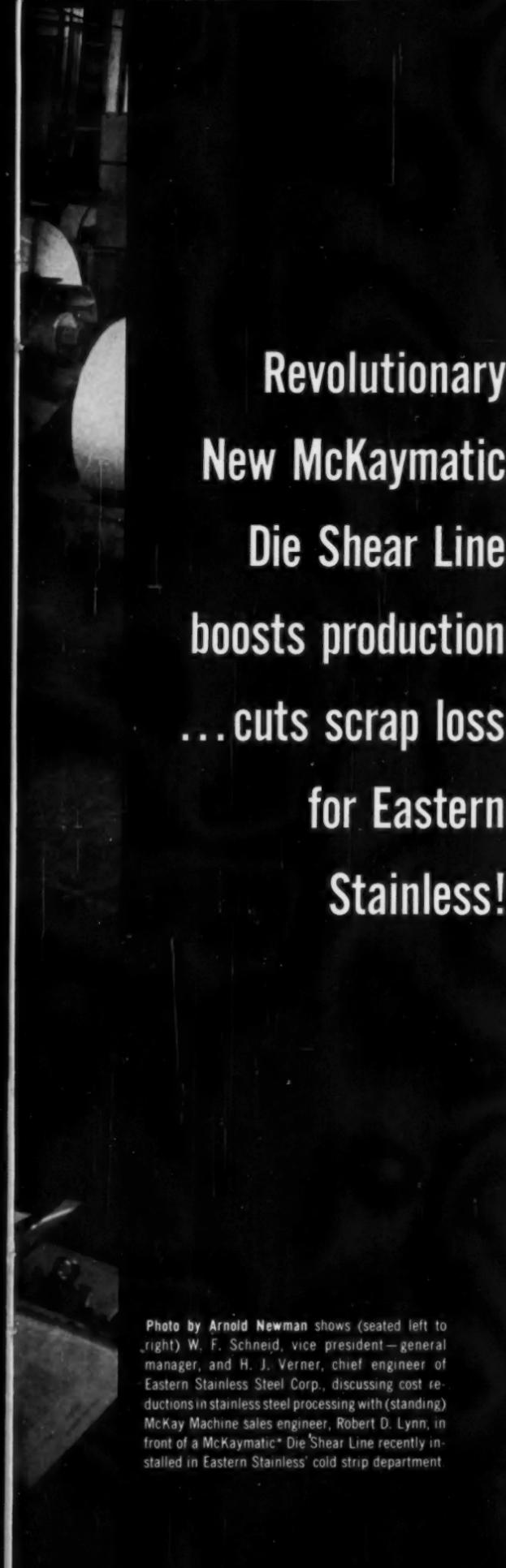
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**Revolutionary
New McKaymatic*
Die Shear Line
boosts production
...cuts scrap loss
for Eastern
Stainless!**

Photo by Arnold Newman shows (seated left to right) W. F. Schneid, vice president—general manager, and H. J. Verner, chief engineer of Eastern Stainless Steel Corp., discussing cost reductions in stainless steel processing with (standing) McKay Machine sales engineer, Robert D. Lynn, in front of a McKaymatic* Die Shear Line recently installed in Eastern Stainless' cold strip department.

"We consider the McKaymatic* the finest advancement in shearing to come along in a great many years," says W.F. Schneid, vice president-general manager, of Eastern Stainless Steel Corporation, Baltimore, Md. "We have reduced production time, cut our scrap loss, and have recorded an overall increase in department efficiency as a direct result of this new McKay die shear line," Mr. Schneid continues.

Eastern Stainless is a prime supplier of stainless steel sheets, strip and plates, for aircraft and missile parts, for food, chemical, paper and textile machinery and for architectural uses. It produces 25 grades of stainless steel in its own modern electric furnace facilities, and ships about sixty-six percent of it in sheet form.

Programs many grades instantly—Through improved roller leveler techniques, Eastern Stainless found it was able to instantly program many grades of sheet through its new McKaymatic* Die Shear Line. The line decoils, levels in a 17-roll McKay Roller Leveler, measures by electronics and cuts to length—replacing a cut-up, re-level, and re-square operation prior to boxing. Production of cut lengths has been substantially increased.

The result, they report, is cost savings. Says Mr. Schneid: "As a result of our efforts to improve customer service, we installed this line to speed up production of these cut lengths. It has enabled us to break a production bottleneck for which there seemed to be no solution."

Line eliminates stretcher leveling—Mr. Schneid continued that production time has been reduced on sheets of five grades as a result of being able to eliminate stretcher leveling and re-squaring procedures. Also, he said, the scrap loss on re-squaring has been eliminated as the sheets are cut clean and square on the McKay line. Net effect of the installation was a definite increase in overall departmental efficiency.

H. J. Verner, chief engineer, remarked that the McKay roller leveler could process these grades of stainless, within its capacity, to flatness approaching that obtained from the stretcher method. He reported that the Die Shear Line is being used to prepare for shipping cold rolled sheet from 4" to 48" in width, up to .050" in thickness, and in lengths from 36" and greater at normal production speeds. He particularly likes the McKaymatic* Die Shear Line for its ability to handle high finish stainless without edge or surface damage.

Available in many sizes—The McKaymatic* Die Shear Line is available in sizes to accommodate most commercial widths. Composed of decoiler (with coil car, if desired), roller leveler, measuring device, and cutoff press, it satisfies most requirements for sheet length accuracy and squareness, flatness, edge and surface quality protection and output rate.

For short runs or long, the McKaymatic* Die Shear Line will better any other line in economy and efficiency. Whatever your cut-to-length problem, McKay Machine's engineers have a solution. Write for literature; send your specific needs for a quotation to McKay Machine Company, Youngstown 1, Ohio.

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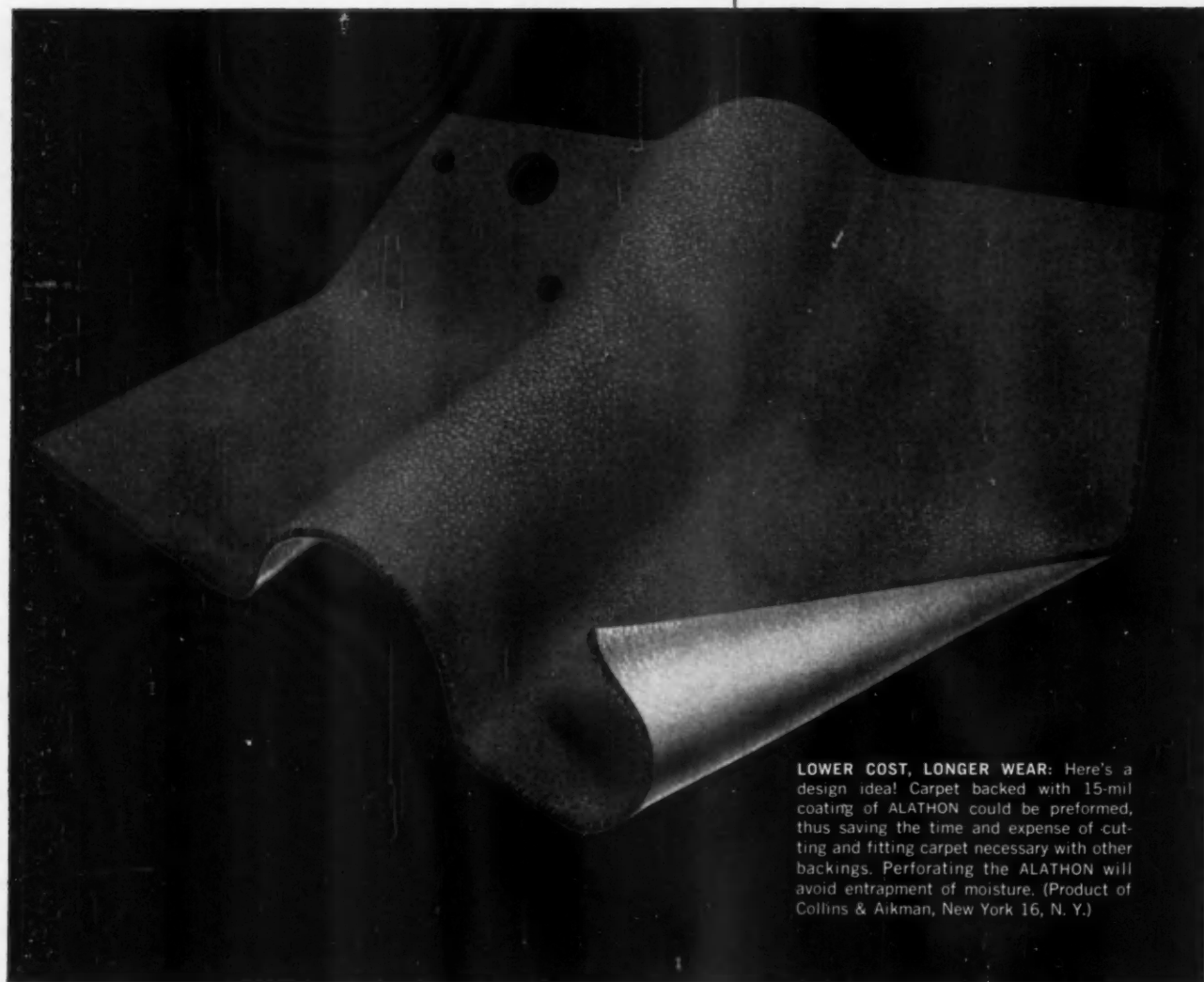
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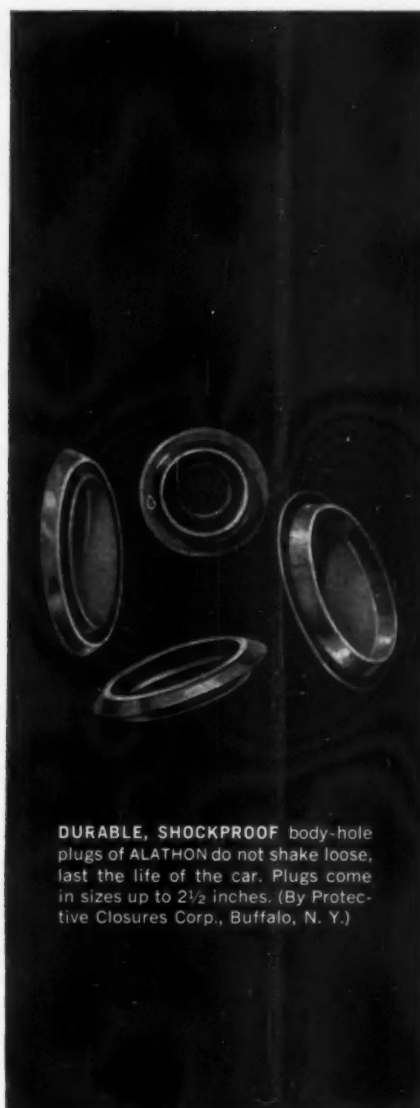
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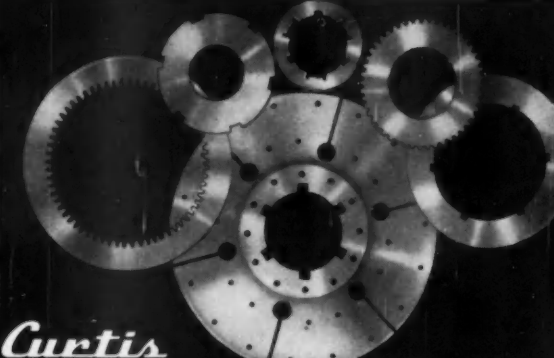
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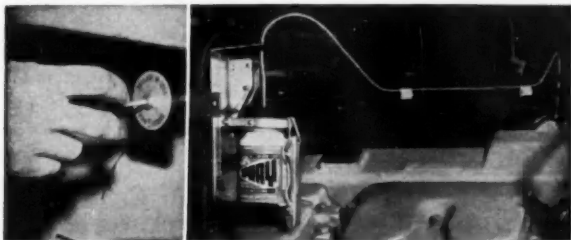
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*Patent Pending

▲ A cover, not shown, protects the mechanism.

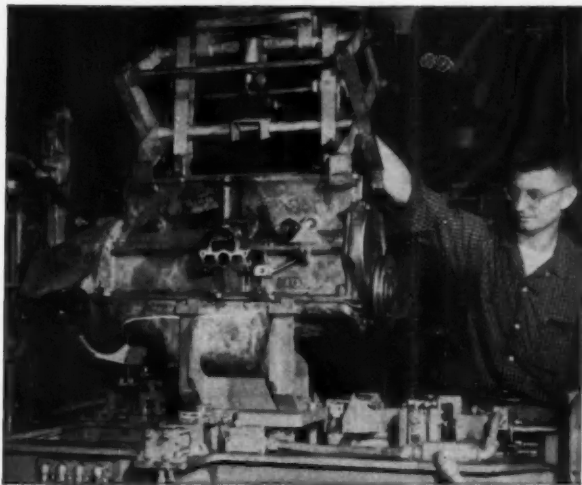
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Air operated lifts are an integral part of the engine block balancers used at Chrysler Corporation's Trenton, Michigan plant. When balancing is completed, the lifts push the blocks upward into Heppenstall Tongs; jaws close automatically, and the block is on its way to the next work station. At the same time, another pair of Heppenstall Tongs is bringing in another block for balancing.

Seventy-five of these 500-lb. capacity Heppenstall Tongs are used to handle 6-cylinder engines of the new Plymouth, Dart and Valiant. Another seventy-five Heppenstall Tongs, slightly different in design, handle V-8 engines on conveyor lines of Dodge, DeSoto, Chrysler and Imperial.

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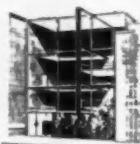
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By C. J. KELLY
ASSISTANT EDITOR

Filter Media 1

Detailed information is shown in a new booklet that covers filter media for process fluids, nuclear applications, internal combustion engines, hydraulic fluids, machine tool coolants, bulk fuel and many other applications. The data provided in the booklet gives an explanation of flow rate, degree of filtration, viscosity of fluids and reliability of many various types of filter media. *Purolator Products, Inc.*

Optical Comparators 2

A pocket size, 20-page booklet discusses the operational characteristics and specifications of optical comparators. It covers what they are and what they do. *Jones and Lamson Machine Co.*

Chrome Data 3

This new data sheet covers various abrasive finishing methods used to produce bright, satin or butler finishes on heavy chrome plate. Material includes recommended compounds, type of buff and buff speeds. *The Lea Manufacturing Co.*

Welding Machines 4

A new 8-page bulletin describes 14 special, high-production, automatic, arc-welding machines with emphasis on production rates obtainable. The bulletin shows special features for automatic operation such as: mechanical loading, inspection and automatic unloading. *Taylor Winfield Corp.*

Cost Factors 5

Seven pages discuss the process of figuring the cost of production for a unit, or units of piece parts in a production operation. Covered are machines, operators, overhead, cutting fluids, time, tools, idle time in relation to parts produced. Graphs and charts along with statistical information are shown to aid in the evaluation. *Master Chemical Corp.*

Spotwelding Tips 6

Resistance welding tips are covered in a new 24-page publication that utilizes the new "RW" taper numbering system for specifying tip size as proposed by the resistance welding alloy association. *Air Reduction Sales Co.*

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Gear Catalog 7

Gears of all shapes, sizes and ap-
plications are covered in a 35-page
publication. It is complete with en-
gineering and design data, and
shows many manufacturing and ap-
plication illustrations. Drawings
give a picture of technical matter.
Spiroid Div., Illinois Tool Works.

Gasket Catalog 8

A new catalog lists 1200 gaskets
for original equipment and stand-
ard replacement. The complete-
line listing includes engine, trans-
mission, differential, and rear-axle
gaskets for cars, tractors, buses,
and trucks. *Sterling Automotive
Mfg. Co.*

Engineering Handbook 9

This handbook is fully illustrated
and describes with drawings and
graphs the simplicity of operation
of patented Taylor liquid spring
shocks using liquid compressibility
and provides nomographs and for-
mulae so the designer can deter-
mine the space reduction for a
given force or energy using a liquid
spring shock. *Taylor Devices, Inc.*

Wire Cloth Filters 10

Typical fluids and systems that
can use Bendix Poromesh and Mi-
cromesh wire cloth filters are dis-
cussed in a new four-page bro-
chure. Details of design features,
environments, construction, per-
formance and metals for these wire
cloth filters are also covered. Pho-
tographs and line drawings illus-
trate this data. *Bendix Filter Div.,
Bendix Aviation Corp.*

Aluminum Welding 11

A complete survey of aluminum
welding, brazing and soldering is
included in a comprehensive, 40-
page, pocket size manual. Illus-
trations and charts are in this ma-
terial and cover the three processes.
All-State Welding Alloys Co., Inc.

Gasket Material 12

Four pages cover a new gasket
material and illustrations show
some of the areas this material has
already been applied to. Charts
show the specifications and strength
data of these gaskets. *Spaulding
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Torque Converter 13

A folder describes a torque converter that is intended for such applications as small road rollers and construction machines, tractors, agricultural equipment, and industrial power transmission, the torque converter has a nine-inch wheel and is rated at 80 lb ft torque input. It is suitable for use with engines in the 10 to 50 hp class without requiring special cooling accessories. *Clark Equipment Co.*

Truck Analysis 14

A comprehensive analysis of industrial trucks for die handling is contained in a new six-page, illustrated folder.

The literature contains full specifications for all Elpar die handling vehicles, now available in capacities from 6,000 lbs to 120,000 lbs. Platform specifications, truck heights, weight and turning space are charted. *The Elwell-Parker Electric Co.*

Free Slide Rule 15

A handy, ideal size, circular slide rule has been offered to any engineer, plant official or office executives that must perform simple calculations in his work. To obtain this device write *General Industrial Co., 1788J Montrose Ave., Chicago 13, Ill.*, on your company letterhead.

Mechanical Deburring 16

Four different types of deburring are described in an illustrated brochure. Types covered are: airless blast method; vibratory deburring; barrel deburring; wet blast deburring. *Wheelabrator Corp.*

Ball Bearings 17

Charts, graphs and illustrations cover a complete line of ball bearings in an eight-page booklet. Cut-away views show the construction details of assembled bearings. *Split Ballbearing, a Div. of MPB, Inc.*

Carbon Dioxide Book 18

A new 24-page booklet shows the uses and value of carbon dioxide to industry. This liberally illustrated booklet covers the history, principal applications, properties and manufacture of carbondioxide in gaseous, liquid and solid. A compendium of information, this booklet contains all the necessary data for readers to gain a clear understanding of how carbon dioxide can be employed in industry. *Pure Carbonic Corp.*

Clutch Catalog 19

Four basic series of general-purpose Formsprag clutches for indexing, backstopping and over-running applications are described in a condensed catalog.

The four clutch series described in the catalog cover a complete range of sizes and torque capacities from 50 lbs in. to 136,500 lbs ft. They range in size from 0.250 in. bore dia to 12,000 in. and their applications include delicate mechanisms such as automatic computers, office machines and modern control devices up to massive conveyors and other heavy industrial equipment. *Formsprag Co.*

Technical Catalog 20

A new technical reference on industrial socket screws, believed by the manufacturer to be the most complete ever compiled, contains 82 pages of extensive design data, performance information and illustrations to completely cover a family of fasteners. *Standard Pressed Steel Co.*

Temperature Control 21

Temperature control packages and their application to a wide variety of industrial processes are described and illustrated in a 12-page bulletin. Schematic drawings show design and construction data. Four charts cover the specification information. *Assemblt Products, Inc.*

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By **C. J. KELLY**
ASSISTANT EDITOR

Air-Hydraulic Boosters22

A complete line of boosters are covered in a new catalog that illustrates cut-away views and contains charts and dimension drawings. Also included is design and engineering data. *The SP Mfg. Corp.*

Tables and Vises 26

Rotary and indexing tables and angle vises are covered in a handy pocket size 18-page booklet. Illustrations, charts and technical information show all the details of the lines. *Palmgren Products, Chicago Tool and Engineering Co.*

Safety Equipment 23

A complete line of mirrors, reflectors, flares and other safety devices are described in a new 16-page brochure. Also included in this booklet is specification information, design data and numerous illustrations. *Miro-Flex Co., Inc.*

Stainless Steel 27

A new booklet contains enough general information and technical data to enable stainless users to make correct design and buying decisions. This publication is completely revised and up-to-date. *Republic Steel Corp.*

Silicone Booklet 24

Silicones for many various applications and industries are described in a new booklet that has numerous illustrations and technical data. Charts and graphs cover the forms, properties and applications of this line. *Dow Corning Corp.*

Metal Cleaning 28

Ultrasonic cleaning, how it operates, advantages and technical data are all covered in an informative brochure that contains illustrations of actual cleaning jobs. *Branson Ultrasonic Corp.*

Fasteners 25

A six-page folder illustrates and describes the manufacturing operations, rigid quality controls, engineering, and plant facilities that are employed in production at the *Standard Screw Co.*

Seamless Tubing 29

The manufacturing capabilities from ferrous and non-ferrous metals and alloys are described in a 12-page brochure. Properties and applications, sizes, wall thicknesses and tolerances are all covered in this publication. *Uniform Tubes Inc.*

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PRODUCT INFORMATION



NEW LAND-RIDING SEAL (Crimped)

N/D's newest seal design. Efficient single lip, low-torque seal protects against moist or dry contaminants. Retains bearing lubricant-for-life. Recommended for farm implement discs, idler pulleys, wheels and similar applications. Available also with metal trash guards to protect seal against mechanical damage from trash windings.



NEW DOUBLE "O" SEAL

N/D's most original seal design, used in fan and water pump bearings where water seepage is prime source of bearing contamination. Synthetic rubber seal rides smooth shaft O.D., offers reliable low-torque sealing and eliminates relubrication.



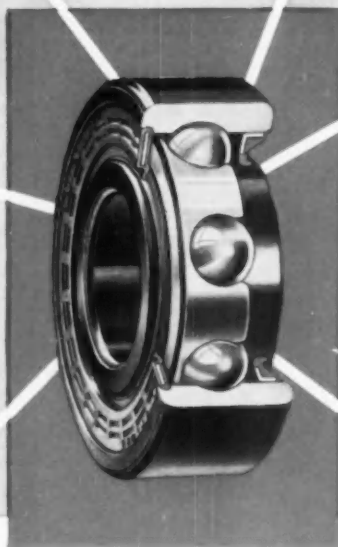
NEW LAND-RIDING SEAL (Pressed) and SENTRI-SEAL

This exclusive seal combination is available in N/D's new heavy-duty conveyor ball bearings. Land-Riding seals, especially resistant to moist contaminant penetration, are available separately in N/D's bearings for hay rake tine bar, plow, hiller and coulters applications. Tandem seal arrangements are also available.



NEW SENTRI-SEAL

N/D's most versatile seal . . . available in most single row, non-loading groove and small double row N/D ball bearings. N/D Senti-Seals are recommended for applications with moderate to severe contaminant conditions as found in light duty discs, idler pulleys, cam followers, implement wheels, adapter bearings and similar applications.



NEW TRIPLE LIP SEAL

N/D's most rugged seal . . . used where moist and dry contaminant conditions are most severe. Seal eliminates relubrication maintenance. It's available in N/D square and round bore ball bearings with either spherical or cylindrical O.D.'s.

Introduces 5 New Integral Ball Bearing Seals!

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control of sealing lip flexibility and torque. Whatever the application, you'll find an N/D integral seal and ball bearing to fit it. All seals are available in popular sizes of New Departure ball bearings.

Write today for N/D's Integral Seal Bulletin. For detailed information, contact the N/D Sales Engineer in your area. New Departure Division, General Motors Corporation, Bristol, Connecticut.



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